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Air power in the corona crisis



Italian Air Force KC-130J MM62178 '46-43' of the 46^a Brigata Aerea brought seriously ill COVID-19 patients from northern Italy to be treated in Leipzig and (pictured here) Dresden, on March 25 and 26 respectively. Timm Ziegenthaler

Air forces around the globe have been playing a prominent role in the military's response to the escalating coronavirus outbreak. In the UK, while London City Airport suspended all commercial and private flights, an RAF C-130 Hercules was noted flying in on March 25 as the shutdown took hold across the country. The airlifter was carrying out a training sortie in support of Ministry of Defence and NHS efforts to create the new Nightingale Hospital at the nearby ExCel Centre to accommodate rising numbers of COVID-19 patients. The airport will likely host further airlift flights in the coming months.

In Europe, German hospitals with spare capacity took in coronavirus patients from Italy, where the death toll was the highest in the world as of late March. A first group of six

Italian patients arrived at Leipzig Airport on the 25th, flown in on board an Italian Air Force KC-130J. The military aerospace industry has also been on hand to help, exemplified by the air-bridge established two days earlier between Toulouse and Madrid by Airbus Defence and Space, using A400M c/n 56 to deliver critically-needed supplies of masks to the Spanish health system. Soon after, Airbus announced it was pausing military production in Spain.

Meanwhile, the virus is also presenting challenges to the military. When crew aboard the nuclear-powered aircraft carrier USS *Theodore Roosevelt* tested positive for COVID-19, the warship was diverted to the US island territory of Guam in the Western Pacific. It was a dramatic example of how the virus can rapidly disrupt wider military planning.

We are able to report that, at time of going to press, production and despatch of our magazine is currently not affected by the ongoing pandemic. We will continue to update you as best we can, should this change. Some postal services may be delayed. You can keep in touch with our latest updates and see what we are doing to keep distribution as smooth as possible by visiting www.keypublishing.com/FAQs.



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Eurofighter and its industry partners are making significant moves on future capability developments. Jamie Hunter and Jon Lake examine what lies ahead for the Typhoon.

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Saab is accelerating the test programme for its Gripen E fighter as it targets new customers around the world – Jamie Hunter reports.

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Despite rapidly declining numbers, the MiG-29 has soldiered on with the Russian air arm's frontline fleet but, as Alexander Mladenov reports, operations with the type are set to stabilise at a relatively low level in the coming decade.

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Kedar Karmarkar concludes his Alaskan assignment with the 18th Aggressor Squadron at Eielson Air Force Base before joining the 'Blue Foxes' for the Sentry Aloha exercise in Hawaii.

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Guerrilla warfare in northern Mozambique has seen Russian private military company,

the Wagner Group, tasked with taking the initiative from a committed jihadist force. But it has not gone well, as Al J Venter explains.

80 Theseus over the Aegean

Introduction of the Mirage 2000-5 Mk2 by the Hellenic Air Force brought 331 Mira into a new era. The type has since evolved into one of the most important deterrents in the armed forces' inventory, as Ioannis Lekkas discovers.

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The International Flight Training School is now well on the way to becoming operational with the Leonardo M-346 Master at Lecce-Galatina air base. Marco Muntz details the latest developments at the training centre in southeast Italy.

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The first airshow of its kind provided a rare opportunity to view the Tunisian Republic Air Force at close quarters. Arnold ten Pas reports from Djerba Airport.



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30 INTEL REPORT: Turkey battles on two fronts

Russia and Turkey came close to war in late February after an air strike in Syria claimed the lives of 34 Turkish troops. At the same time, Russian and Turkish soldiers were patrolling together along the Syrian/Turkish border, while Ankara was also waging a separate campaign in Libya. Alan Warnes investigates.

40 FORCE REPORT: Cypriot Air Force

Spearheaded by two squadrons of attack helicopters and one specialist search and rescue unit, the Cypriot Air Force is one of Europe's youngest – and smallest – air arms. Marinus Dirk Tabak and Jack Bosma visited Andreas Papandreou air base at Paphos International Airport to find out more.

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While high-end, dedicated attack rotorcraft



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are normally the preserve of only the best-funded air arms, helicopters equipped for close air support are increasingly commonplace. Air Power Association President, Air Marshal (ret'd) Greg Bagwell CB CBE examines the pros and cons of rotary-winged platforms as a means of delivering air power.

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Cover: Up close and personal with a two-seat Mirage 2000-5BG of the Hellenic Air Force's 331 Mira 'Theseus'. The 'Dash 5' Mirage is considered the most advanced air superiority fighter in the Greek inventory but it also has an important long-range precision strike role using the SCALP-EG cruise missile. Compared with the previous Mirage 2000EG/BG, the 'Dash 5' offers a potent combination of RDY-2 radar, ICMS Mk3 electronic warfare suite, MICA air-to-air missiles and a totally redesigned fully glass cockpit. Kedar Karmarkar **Above:** A well-worn MiG-29 izdelye 9.12A 'Fulcrum-A' – one of the very oldest of the type remaining in Russian military service – launches from Astrakhan-Privolzhsky airfield for a mission during the Shtit Souza (Union's Shield) international exercise held in September 2012. In this issue, Alexander Mladenov begins a two-part report on the Russian Aerospace Forces' rapidly dwindling MiG-29 fleet. Andrey Zinchuk



ACC will experiment with the AT-6 to further examine the ways in which a common architecture and intelligence-sharing network will connect platforms, sensors and weapons and deliver a digital network for light attack aircraft. Textron

USAF awards contracts for AT-6 and A-29

TWO LIGHT attack platforms – the Sierra Nevada Corporation (SNC)/ Embraer A-29 Super Tucano and Textron AT-6 Wolverine – have been ordered for the USAF under contracts placed to continue the Light Attack Experiment. Orders for two of each type were placed in early and mid-March respectively. The Textron

deal is worth US\$70.2m, including pilot training, engineering services and up to four years of contractor support for maintenance and spares, while that for SNC is reportedly valued at up to around US\$129m.

While the Super Tucanos will operate with Air Force Special Operations Command (AFSOC) at Hurlburt Field in Florida, the

Wolverines will be assigned to Air Combat Command (ACC) at Nellis Air Force Base (AFB) in Nevada.

AFSOC will use its aircraft to develop an instructor pilot programme for the Combat Aviation Advisory mission on behalf of partner nations. Meanwhile, ACC will use its Wolverines for continued testing and development of operational tactics

including the Airborne Extensible Relay Over-Horizon Network (AEROnet) data-sharing network.

The A-29s will be delivered next year and will train foreign militaries until 2024.

In a USAF press release, Chief of Staff Gen David L Goldfein said: "Our focus is on how a light attack aircraft can help our allies and partners as they confront

violent extremism and conduct operations within their borders. Continuing this experiment, using the authorities Congress has provided, gives us the opportunity to put a small number of aircraft through the paces and work with partner nations on ways in which smaller, affordable aircraft like these can support their air forces."

UK Lightnings declared IOC despite problems

THE UK declared Initial Operating Capability (Land) for its F-35B fleet despite issues relating to availability, infrastructure, logistics and security, the UK National Audit Office (NAO) has revealed. According to the NAO, clearance for IOC (Land) was granted in December 2018 with 67 exceptions, around a third which were yet to be resolved more than a year later.

The NAO report highlighted delays in providing synthetic training facilities ahead of the IOC (Land) milestone as well as lack of operational availability of the aircraft themselves. Planned use of simulators for training has been hampered by

"technical difficulties and delays in security vetting".

The exemptions introduced to meet IOC (Land) included the Lightning "not being able to demonstrate deployability through a planned exercise", due to aircraft availability, reliance on contractors for mission support due to limited numbers of trained RAF personnel, and lack of access to mission support training facilities in the US. The NAO also identified problems in the RAF's ability to program aircraft with UK mission data independently of the US, although this has since been resolved. The office noted that the RAF and Royal Navy have made progress in training and logistics.



A pair of F-35B Lightnings assigned to No 617 Squadron from RAF Marham, Norfolk, during Exercise Red Flag at Nellis Air Force Base in Nevada, earlier this year. Crown Copyright

Sikorsky and Bell win US Army FLRAA awards



THE US Army has taken the next step towards replacement of its H-60 Black Hawk fleet with the award of competitive demonstration and risk reduction (CD&RR) contracts to Sikorsky (valued at US\$97m) and Bell (US\$84m) for

the Future Long-Range Assault Aircraft (FLRAA). Over the next two years, the companies will deliver initial conceptual designs, requirements feasibility and trade studies. After this phase of risk-reduction work, final requirements will be

defined and a programme of record launched in 2022. Two advanced rotorcraft were built for the army's Joint Multi-Role Technology Demonstration (JMR TD), the precursor to FLRAA. These are the Bell V-280 Valor and the Sikorsky/Boeing SB-1 Defiant. In

According to the manufacturer, the Bell V-280 has achieved all programme goals to date, including flying at speeds greater than 300kts and demonstrating low-speed agility. Bell

a flight-test programme over more than two years, Bell completed a greater number of flight hours (170-plus), but Sikorsky/Boeing compensated for this with extensive 'iron bird' ground tests. The FLRAA programme aims to have a first US

Army unit equipped with production aircraft in Fiscal Year 2030. FLRAA is intended to enable multi-domain operations, to fly further and faster than existing aircraft and also to provide air assault and medical evacuation support in contested environments.

US air strikes escalate in Iraq

THE USAF undertook retaliatory air strikes against Iranian-backed militias in Iraq following a March 11 rocket attack on Camp Taji that killed two Americans and one British soldier. The air raids were directed against five weapons storage facilities across Iraq belonging to the Iranian-backed Kataib Hezbollah group. The same group was responsible for a rocket attack on a US target in Iraq last December, killing an American contractor and leading to another round of retaliatory US strikes, followed by the January drone strike in Baghdad that killed Iranian military leader Qasem Soleimani. Following the latest US raids, a Pentagon statement said: "These strikes were defensive, proportional, and in direct response to the threat posed by Iranian-backed Shia militia groups who continue

to attack bases hosting coalition forces supporting Operation Inherent Resolve." Despite the latest US strikes, air operations by US and coalition forces in Iraq and Syria have remained fairly limited. Aircraft dropped 85 weapons in February, an increase of 17 over the previous month and in contrast to the 607 of February last year. By the end of February 2020, 2,369 surveillance sorties had also been flown.



A USAF F-15E over Iraq on March 11. USAF/Tech Sgt Matthew Lotz

Bell and Sikorsky selected for FARA fly-off



Above: One of the latest computer-generated artworks of the Sikorsky Raider X reveals the capacious weapons bay afforded by the side-by-side crew seating. The bay could ultimately accommodate UAVs and/or loitering weapons. Sikorsky

THE US Army has chosen Bell and Sikorsky to design and test competitive prototypes for its Future Attack Reconnaissance Aircraft (FARA) programme. The prototypes are scheduled to start flying in the fourth quarter of Fiscal Year (FY) 2022, before the winner is selected in a fly-off competition no later than autumn 2023. The engineering and manufacturing development phase is expected to begin in FY24.

Bruce Jette, assistant secretary of the US Army for acquisition, logistics and technology,

explained: "The Future Attack Reconnaissance Aircraft is the army's number one aviation modernisation priority and is integral to effectively penetrate and disintegrate adversaries' integrated air defence systems.

"It will enable combatant commanders with greater tactical, operational and strategic capabilities through significantly increased speed, range, endurance, survivability and lethality."

Significantly, Bell and Sikorsky's proposals are both conceptually based on aircraft that are already flying.

The Bell 360 Invictus concept utilises the rotor system derived from that of the Bell 525 Relentless. It also features a wing to generate additional lift. The Sikorsky Raider X is based on the S-97 Raider demonstrator, a coaxial helicopter with a pusher propeller.

The companies that didn't progress further in the evaluation were AVX Aircraft, which was partnered with L3Harris, Boeing and Karem Aircraft.

Under FARA, the US Army hopes to introduce a new scouting and light attack helicopter by 2028.

Second RAF Poseidon arrives at Kinloss

THE RAF took delivery of its second P-8A Poseidon MRA1 when the maritime patrol aircraft arrived in the UK on March 13. Named *City of Elgin*, ZP802 flew into Kinloss Barracks in Scotland six weeks after the first aircraft, ZP801 *Pride of Moray*, which arrived from the US on February 4 (see *UK Poseidon*

makes progress, April, p8). The second aircraft had completed its maiden flight on September 15 last year (see *Second UK Poseidon flies*, November 2019, p8) and was delivered to Naval Air Station Jacksonville, Florida, on February 5 for initial flight testing.

Both these aircraft and the remaining seven to be

delivered will ultimately be operated from nearby RAF Lossiemouth, where a £75m project to resurface the runways is scheduled for completion later this year. Operations from Lossiemouth are set to commence early in the fourth quarter, the type initially being flown by No 120 Squadron, with No 54

Squadron serving as the operational conversion unit (OCU). The second frontline RAF Poseidon unit, No 201 Squadron, is due to be formally established at Lossiemouth next year. All nine aircraft will be delivered to the RAF by the end of 2021 and full operational capability is anticipated in 2024.



P-8A Poseidon MRA1 ZP802, 'City of Elgin', lands at Kinloss Barracks for the first time. Crown Copyright

DHFS becomes No 1 FTS

A CEREMONY was held recently at RAF Shawbury, Shropshire, to formally re-badge the Defence Helicopter Flying School (DHFS) as No 1 Flying Training School (1 FTS). The February 28 event also saw a state-of-the-art DHFS training facility formally named by the Chief of the Air Staff, ACM Mike Wigston, as the Duke of Cambridge Building, in

honour of Prince William, who completed advanced flying training at the Ascent Flying Training-run DHFS and was awarded his aircrew flying badge in January 2010. The facility houses advanced flying training devices where aircrew learn many of their skills before getting airborne in the fleet of 29 Juno HT1 (H135) and three Jupiter HT1 (H145) helicopters.

No 1 FTS had previously flown the Tucano T1 at RAF Linton-on-Ouse, North Yorkshire, but was disbanded last October 25, when the final course graduated and the Tucano was retired – see *RAF ceases Tucano flying operations*, December 2019, p8. Because it is the RAF's oldest training school, having formed on December 23, 1919, at

Netheravon, Wiltshire, all three services agreed that the historic name should be transferred to Shawbury to re-badge the DHFS so that the designation is retained in service.

In a related move, operation and upkeep of military flying at RAF Topcliffe, North Yorkshire, which was previously under the control of 1 FTS, was transferred to 2 FTS on October 30 last year. The airfield had been used as a relief landing ground for the Tucanos of 1 FTS but since their retirement, the only military operations are by 645 Volunteer Gliding Squadron, which as of February only had a single Viking T1 allocated, although it was expected to be joined soon after by a second. The transfer to 2 FTS (which is headquartered at RAF Syerston, Nottinghamshire) is therefore logical, as 2 FTS is in charge of providing all glider training for RAF air cadets.

The RAF element at Topcliffe is now just a small enclave located within the much larger Alanbrooke Barracks, after the British Army took over most of the airfield in 1974. **Dave Allport**



Above: Trainee aircrew and pilots demonstrate the simulator training facilities at the Duke of Cambridge Building as part of RAF Shawbury's No 1 FTS. Crown Copyright

No 216 Squadron re-forms at Waddington

A NEW RAF unmanned aerial vehicle unit has been established, initially based at RAF Waddington, Lincolnshire. No 216 Squadron was officially re-formed at the base on April 1.

The experimental unit will work on developing an operational capability using the so-called 'swarming drone' concept. Trials are already being carried out by the RAF's Rapid Capabilities Office, which also supports the new Tempest fighter project, and No 216 Squadron will bring the capability into service, as well as continuing further development.

The then Secretary of State for Defence Gavin Williamson announced at the Royal United Services Institute back on February 11, 2019, that the UK would develop swarming drones to confuse and defeat enemy air defences, using financing from the Transformation Fund, which is designed to fast-track advanced projects for the armed forces. He said they would be operationally fielded by the end of that year, although obviously that timescale has slipped (see *In Brief*, March, p11). It is currently unclear when the swarms of network-enabled drones will become available for service, despite earlier optimism and previous suggestions at the Air and Space Power Conference on July 17, 2019, by then-Chief of the Air Staff, ACM Sir Stephen Hillier, that it could be as early as July this year. They will operate in conjunction with the UK's Lightnings and Typhoons.

No 216 Squadron was formed as an RAF bomber unit in April 1918, but through most of its history served primarily in a transport and flight refuelling role. It was last operational flying the Tristar from RAF Brize Norton, Oxfordshire. The unit disbanded on March 20, 2014, with the withdrawal of the Tristar fleet. **Dave Allport**

All 50 AAC AH-64Es now under contract



Above: An Army Air Corps Apache AH1 recently took part in a trial during which it was loaded onto an A400M Atlas mock-up. The event took place at the Joint Air Delivery Test and Evaluation Unit (JADTEU) at RAF Brize Norton, Oxfordshire, in mid-March and involved the Air Portability (AP) Section together with 7 Aviation Support Battalion, Royal Electrical and Mechanical Engineers. Subsequent trials will load an Apache onto a 'live' Atlas airframe. Crown Copyright

THE UK now has all 50 planned AH-64E Apaches under contract, having previously committed to remanufacturing 38 older WAH-64D Apache AH1 attack helicopters. The Ministry of Defence has confirmed that the remaining 12 are now formally included in the programme, after the US Department of Defense issued a contract notification for support and training "for the United Kingdom AH-64E Apache helicopter fleet of 50 aircraft".

In May 2017 a US\$488.1m Foreign Military Sales (FMS) modification contract was

placed with Boeing for the remanufacture of 38 WAH-64Ds as part of a wider Lot 7-11 production run, plus procurement of three Longbow crew trainers and associated spares. Work was to be completed at Mesa, Arizona, by May 31, 2024. By June last year, 16 Apache AH1s had been delivered to Mesa for the AH-64E remanufacture programme. They will combine new airframes, engines, rotor blades, and avionics with high-value components recovered from the legacy Apache AH1 inventory.

These include the fire-

control radar mast-mounted assembly, the Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS), the main rotor hub and other transmission elements, and some structural components.

The final 12 Apache AH1s for remanufacture are covered by a US\$565.5m FMS modification contract issued last December 18 which encompasses rework of 47 aircraft for the Netherlands, United Arab Emirates and UK. The estimated completion date is March 1, 2025.

Busy times for RAF QRA

TYPHOON FGR4s from RAF Lossiemouth, Scotland, and RAF Coningsby, Lincolnshire, scrambled to conduct air policing missions three times in six days during March, intercepting Russian military aircraft flying in the UK's Flight Information Region (FIR). The fighters, supported by Voyager air-to-air refuelling aircraft and co-ordinated by battle managers at the National Air and Space Operations Centre at High Wycombe and the Air Surveillance and Control System at RAF Boulmer, intercepted and shadowed Russian *Bear* and *Blackjack* aircraft.

On March 7, quick reaction alert (QRA) Typhoons from the two bases encountered a pair of Russian Naval Aviation Tu-142s – a Tu-142MK *Bear-F Mod 3* long-range anti-submarine aircraft and a Tu-142MR *Bear-I* strategic radio-relay aircraft. The Russian aircraft were intercepted west of the Shetland Islands and shadowed throughout their time in the UK's FIR and area of interest. According to the RAF, the Russian aircraft

were operating "in and around" many of the routes used by civilian airliners.

A second interception on March 11 involved two QRA Typhoons from Lossiemouth intercepting another pair of Russian Naval Aviation Tu-142 *Bear-F*s in a similar location. The Typhoons escorted them as they continued around the west coast of Ireland towards the southwest of the UK. The jets remained off the coast near Penzance, while the French Air Force took over the intercept. The two *Bear-F*s returned on the same route and were met by a second pair of Typhoons from Lossiemouth.

A day later, three Typhoons were scrambled to intercept a pair of Russian Aerospace Forces Tu-160 *Blackjack* bombers that approached the UK, before flying down the west coast of Ireland, towards the Bay of Biscay where they were also met by QRA jets from the French Air Force. Returning north, the Tu-160s were again shadowed by RAF Typhoons.

At no time did these Russian aircraft enter UK sovereign airspace.



An RAF Typhoon FGR4 escorts Russian Naval Aviation Tu-142MK 'Bear-F Mod 3' '97 Black'/RF-34057 (c/n 2603305) from the 5th Independent ASW Squadron at Kipelovo/Fedotovo on March 7. Crown Copyright



RAF Globemaster III delivers aid for Idlib crisis

RAF C-17 ZZ172 'on the pan' prior to being loaded with humanitarian aid destined for those affected by the worsening humanitarian crisis in Idlib, Syria. The Globemaster III from No 99 Squadron at RAF Brize Norton, Oxfordshire, delivered 37 tonnes of UK aid to Hayat on the Turkey-Syria border on March 11. The supplies were for around 300 families forced to flee their homes due to the civil war in Syria. A team of six personnel from UK Mobile Air Movements Squadron (1 Air Mobility Wing) based at RAF Brize Norton accompanied the cargo into Turkey to facilitate the offload and handover.

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European Lightning IIs train with stealth bombers



Above: B-2A 88-0332 'Spirit of Washington' assigned to the 509th BW, accompanied by Royal Netherlands Air Force F-35A F-009 from Leeuwarden Air Base, over the North Sea on March 18. USAF/Master Sgt Matthew Plew

FOR THE first time, USAF B-2As have taken part in interoperability missions with F-35As from the Netherlands and Norway, during the latest Bomber Task Force 20-2 rotation to Europe.

The two Spirits deployed from Whiteman Air Force Base, Missouri, to RAF Fairford, Gloucestershire, flew alongside a Royal Netherlands Air Force (RNLAf) F-35A on March 18. The stealth aircraft took part in a familiarisation flight over the North Sea, accompanied also by F-15Cs from the 48th Fighter Wing at RAF Lakenheath, Suffolk.

One day earlier, as part of the same deployment, the pair of B-2s also flew alongside Norwegian

F-35s for the first time. The Spirits conducted tactical integration training with three Royal Norwegian Air Force F-35As over Iceland and the North Atlantic. At the time, the Lightning IIs were stationed at Keflavík for a three-week period, conducting NATO's Iceland Air Policing mission (see *Norwegian F-35As deploy to Iceland*, April, p11). The F-35s were airborne for around one-and-a-half hours, spending some 30-45 minutes training with the bombers.

The B-2s from the 509th and 131st Bomb Wings (BW) were deployed to Europe on March 9. They began operations from Lajes Field, Azores, Portugal, before moving to Fairford.



A trio of Royal Norwegian Air Force F-35As - serials 5205, 5149 and 5288 - formate with a B-2A above Keflavík on March 17. USAF/Master Sgt Matthew Plew

First Red Flag for Italian E-550A

AN AERONAUTICA Militare (AM, Italian Air Force) Gulfstream E-550A (G550) Conformal Airborne Early Warning (CAEW) aircraft has participated for the first time in Exercise Red Flag at Nellis Air Force Base, Nevada. The aircraft, MM62293 '14-11', was deployed from the 14° Stormo/71° Gruppo based at Pratica di Mare to take part in Red Flag 20-2, which took place from March 9-20. During the exercise, it flew primarily night missions, giving crews training in battle

management command and control (BMC2) in a large-force employment exercise context. It was also used as an airborne mission co-ordinator for Joint Personnel Recovery missions. The AM participation also included Eurofighter F-2000s and F-35As, marking the first time since 1989 that three different types of AM aircraft participated in a Red Flag exercise.

The F-35As, also making their Red Flag debut, came from the 32° Stormo

Italian Air Force E-550A CAEW MM62293 '14-11' at Nellis AFB, Nevada, during Red Flag 20-2. AMI



at Amendola, while the Eurofighters were from the 4° Stormo at Grosseto, 36° Stormo at Gioia del Colle and 37° Stormo at Trapani. During the two weeks of Red Flag 20-2, the AM

aircraft flew around 200hrs, operating jointly in various missions to test tactics and interoperability in scenarios that could not be replicated on home territory. The six AM F-35As deployed to Nellis

flew both day and night sorties, often in formations of four, undertaking escort, suppression of enemy air defences (SEAD), air interdiction and dynamic targeting. **Dave Allport**

Germany says 'Goodbye Huey'

WITH THE Heeresflieger (German Army Aviation) Bell UH-1D fleet scheduled for retirement in the search and rescue (SAR) role on June 30, an example has received a special scheme to mark the type's Bundeswehr service,

which began in August 1967. UH-1D 73+08 was presented in its 'Goodbye Huey' paintwork by Transport-hubschrauberregiment 30 (TrspHubschrRgt 30, Transport Helicopter Regiment 30) at the type's last operating base, Niederstetten in Baden-

Württemberg, on March 5. Nicknamed 'Teppichklopper' (Carpet-beater) in German service, the UH-1D will be replaced by the H145M SAR, the first of which was delivered last December 10 (see *H145M SAR handed over to German Army*, February, p15). The H145M SAR will

eventually be stationed at Niederstetten, Holzdorf and Nörvenich. The final example of a further six is scheduled to be delivered early next year.

The UH-1D is due to make a farewell tour in its new livery, visiting several locations in Germany, Austria, Switzerland and Italy. It was also going to

be presented at the ILA Berlin and the Tag der Bundeswehr (both now cancelled due to the coronavirus outbreak) and at the Rivotto Airshow in Italy, plus many other, smaller, public and private events in Germany. The latest schedule of events will be listed at: www.goodbyehuey.de



Mathias Grägel

Spanish Air Force SAR NH90 prepares for delivery

AIRBUS HELICOPTERS is close to delivering the first NH90 to the Ejército del Aire (EdA, Spanish Air Force) for operation by Ala 48/803 Escuadrón at Cuatro Vientos air base, Madrid. The helicopter is an NH90 TTH (SAR) variant configured for search and rescue, and an image released by the EdA on March 10 shows it on the ramp outside the factory at Marseille-Marignane, France, fully painted in overall grey with black Ejército del Aire and SAR titles.

It is serial HD.19-16, coded '803-16', and for testing also carries c/n 1425 and test registration F-ZWCK temporarily taped to the inside of the rear cabin window.

Currently, 803 Escuadrón operates the AS332B/B1 Super Puma. In preparation for the arrival of its NH90 SAR element, new infrastructure, including a hangar and additional ramp area, have been built at Cuatro Vientos. According

to local reports, Spain is considering expanding Ala 48 with a second SAR NH90 unit, which would become 804 Escuadrón.

A total of 12 NH90s are currently on order for the EdA. The first six were

contracted under the initial phase of Spain's NH90 acquisition programme which, after a number of budget cuts, was reduced to 22 helicopters, of which the other 16 are all entering Fuerzas Aeromóviles del

Ejército de Tierra (FAMET, Spanish Army Aviation) service. A contract for a second tranche was finalised on January 2 last year, covering 23 more, including the remaining six for the EdA, plus seven for

the Flotilla de Aeronaves (FLOAN, Spanish Naval Aviation) and ten more for the FAMET. These will all be assembled locally by Airbus Helicopters España at its Albacete facility. **Dave Allport**

Spanish Air Force SAR NH90 HD.19-16 '803-16' on the ramp outside the Airbus Helicopters factory at Marseille-Marignane on March 10. This is the first of 12 on order and is expected to be delivered shortly. Ejército del Aire



Six more Bayraktar TB2s delivered to Turkish Gendarmerie

A FURTHER six Bayraktar TB2 SIHA medium-altitude, long-endurance unmanned aerial vehicles have entered service with the Türk Jandarma Genel Komutanlığı (Turkish Gendarmerie General Command). Delivery

of the UAVs was announced on February 29 by Ismail Demir, president of Turkey's Savunma Sanayii Başkanlığı (SSB, Presidency of Defence Industries). The SIHA (Silahlı İnsansız Hava Aracı, Armed Unmanned Aerial Vehicle) is the weaponised version of

the TB2. The type is flown by the Jandarma's İnsaniz Hava Aracı Filo (Unmanned Reconnaissance Squadron) at Elazığ, which also operates the TAI Anka UAV. The Jandarma took delivery of its first six Bayraktar TB2s (including two armed

SIHA variants) in March 2017. On September 28, 2019, the SSB announced delivery of a further six (see *UAVs for Turkish Jandarma*, November 2019, p12). Most branches of the Turkish Armed Forces are now operating the TB2, which

is also in service with the Türk Hava Kuvvetleri (THK, Turkish Air Force), Türk Kara Kuvvetleri (TKK, Turkish Land Forces), Emniyet Genel Müdürlüğü (EGM, Turkish National Police) and Türk Deniz Kuvvetleri (TDK, Turkish Navy). **Dave Allport**

PC-12NG for Irish Air Corps breaks cover

THIS MILITARY-modified PC-12NG, wearing US civil registration N281NG (c/n 1838, future serial 281), is understood to be the second of three examples ordered for the Irish Air Corps (IAC), and is now undergoing fitting out in the US. The first example, N280NG (c/n

1795, future serial 280), is already fully painted but has so far only been noted flying at night. The third aircraft for the IAC is likely to be N282NG, also still unpainted as of mid-March.

The IAC ordered three PC-12NG utility aircraft under a deal worth around

€32m, including equipment, with the contract for them signed at Baldonnel-Casement Aerodrome on December 19, 2017. They will be used for intelligence, surveillance and reconnaissance (ISR) missions, medical evacuation and logistics support.

Each has the capacity for nine passengers or will be able to accommodate two stretcher patients along with support staff for the medical evacuation role. The first example took to the air in May 2018 and arrived in the US for fitting out the following June.



Paul Filmer

North Macedonia seeks to restore UAV capability

NORTH MACEDONIA will soon restore operations by its ultra-secretive police unit equipped with Elbit Systems Hermes 450 UAVs, interior minister Nakje Chulev has revealed.

Chulev said he would call upon the government

to reactivate the drones, which are in a "functional condition", to provide surveillance during the coronavirus crisis.

Macedonia began operating the Hermes 450 in 2009 when four examples were acquired

for the Ministerstvo za Vnatrešni Raboti (MVR, Ministry of Internal Affairs), subordinated to the Uprava za Bezbednost i Kontrarazuznavanje (UBK, Administration for Security and Counterintelligence).

Operating from the

police base codenamed Brest (Elm), at Skopje International Airport, one of the drones was reportedly heavily damaged in a landing accident.

The three survivors are serials MAP-7781 to MAP-7783. **Igor Bozinovski**

Albania leases A319CJ for VIP transport

A FORMER Turkish government Airbus A319CJ has been leased by the Albanian government as a new VIP transport. A319-115X TC-ANA (c/n 1002) was first noted in service on February 14, when it flew into Munich, Germany, bringing delegates for the Munich Security Conference. It has been repainted with a modified version of its previous white and red Turkish livery, to which has been added an additional curved black cheat line below the original red one and three black flashes on the tail in place of the Turkish national markings, although it has retained the Turkish registration.

This 20-year-old aircraft was originally built as a VIP transport for the Italian Air Force as MM62173 and delivered in February 2000. It was sold to the Turkish government in 2005. The length of the lease to Albania has not yet been confirmed. **Dave Allport**

Second new Dash 8 delivered to Sécurité Civile

FRANCE'S SÉCURITÉ Civile has taken delivery of its second Multi-Rôle Bombardier d'Eau de Transport (MRBET, Multi-Rôle Water Bomber and Transport) at its base in Nîmes-Garons. The Direction générale de

l'armement (DGA, France's defence procurement agency) announced on March 3 that it had handed over F-ZBMI/'76' (c/n 4579, ex C-GFKW), call sign 'Milan 76', at Nîmes. The MRBET is based on the Dash 8-Q402 Multirole Enhanced (Q400 MRE) airframe, modified to fight forest fires and transport people and cargo.

Canadian company Conair was awarded a contract on January 8, 2018, for the provision of six MRBET aircraft, for delivery between

2019 and 2023 to replace the Turbo Firecat fleet. The latter were to be progressively retired as new MRBET aircraft were delivered, but concerns over an undercarriage fault meant that all 11 were permanently grounded in February (see *In Brief*, April, p13). The first MRBET, F-ZBMH '75' (c/n 4577, ex C-FXFK), arrived at Nîmes on June 18 last year (see *Feedback*, September 2019, p85).

The MRBET has considerably expanded

mission capabilities compared to the Firecat. In addition to firefighting and transport, these will ultimately also include 'Evasan' medical evacuation missions, for which it can be changed to a dedicated configuration enabling carriage of six stretcher patients.

Prior to entry into service of the second aircraft, a two-phase verification operation was undertaken by the DGA. The first was completed in Canada in

conjunction with Conair in January. Then, after the aircraft had been flown to France, the second phase was completed at Nîmes prior to formal acceptance by the DGA on February 14, followed by subsequent integration into service.

Prior to the new order, the Sécurité Civile already had two Dash 8-Q400s in service, acquired secondhand in 2005 and modified into water bombers by Cascade Aerospace in Canada. **Dave Allport**



The second Sécurité Civile Dash 8-Q402 MRBET aircraft, F-ZBMI/'76', following delivery to Nîmes. DGA

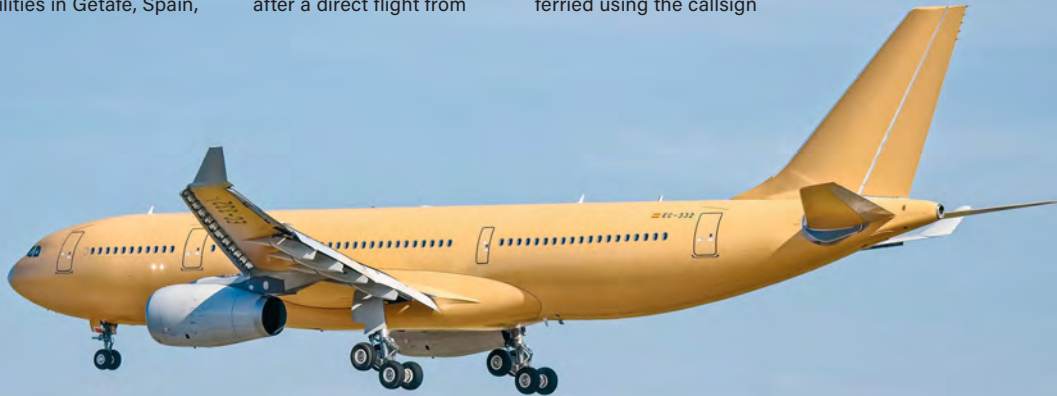
Latest Phénix heads for conversion

THE FIFTH A330-243 for the Armée de l'Air (French Air Force) has been delivered to Airbus facilities in Getafe, Spain,

for conversion to Multi-Role Tanker Transport (MRTT) standard. The service's fifth Phénix arrived at Getafe after a direct flight from

Toulouse-Blagnac Airport, France, on the afternoon of March 13. The aircraft, c/n 1965, ex F-WWKT, was ferried using the callsign

'AED332' and temporary registration EC-332. It had flown for the first time at Toulouse on February 21.



Wearing the temporary registration EC-332, this is c/n 1965, which will become the Armée de l'Air's fifth Phénix. Roberto Yáñez

Mixed fighter buy for Luftwaffe?

A REPORT in the German financial newspaper *Handelsblatt* suggests the Luftwaffe will opt for a mixed force of up to 90 Eurofighters, 30 F/A-18E/F Super Hornets and 15 EA-18G Growlers to replace its remaining Tornado

fleet, as well as Tranche 1 Eurofighters. According to the publication, the Super Hornet acquisition would fulfil the NATO requirement to field a nuclear-capable fighter to deliver the B61 tactical gravity bomb. The Growlers would serve as

a direct replacement for the Tornado ECR in the electronic attack role.

However, both the Super Hornet and the Eurofighter would require further modification and certification for the nuclear strike role.

The previous Luftwaffe

chief, Lt Gen Karl Müllner, lost his job in 2017, reportedly after expressing his preference for the F-35 to succeed the approximately 85 remaining Tornados, and Germany officially removed the Lightning II from the running last year.

Luftwaffe A350 in service colours

THE FIRST Luftwaffe Airbus A350-941CJ VIP transport, now wearing its full paint scheme, departs Hamburg Finkenwerder Airport, Germany, on its return to the Airbus facility at Toulouse-Blagnac Airport, France, on March 20. As reported last

month, the aircraft, F-WZFF (c/n 416), completed its maiden flight from Toulouse on February 21 (see *First Luftwaffe A350 takes flight*, March, p11). The aircraft was originally allocated for Lufthansa as D-AIXQ, but has been re-allocated

as the first of three for the Luftwaffe, presumably to enable earlier delivery.

The budget committee of the German Bundestag had given approval on April 11, 2019, for the purchase of three A350-900s (see *Overhaul for Luftwaffe's VIP*

fleet, June 2019, p12). The aircraft will replace the two VIP A340-313Xs operated by the Flugbereitschaft des Bundesministeriums der Verteidigung (FBS BMVg, Flight Service of the German Ministry of Defence) at Köln-Wahn.



v1images.com/Dirk Grothe

In Brief

■ Luftwaffe ends Tornado counter-IS missions

Germany concluded its Tornado reconnaissance mission against so-called Islamic State on March 31. Four of the jets had been operating from Al-Azraq in Jordan since July 2017, after previously conducting the mission from Incirlik, Turkey.

■ French Air Force seeking to lease 20 EC225s

More details have emerged of plans for the French Air Force to replace its current Puma fleet by leasing up to 20 EC225 helicopters. The defence ministry has issued a request-for-tender and the contract would include modifications for the search and rescue (SAR) and security and intervention missions.

■ Germany approves Heron TP for Afghan mission

The latest funding approval from the German parliament's budget committee includes more than €36m to continue the System Abbildende Aufklärung bis in die Tiefe des Einsatzgebietes (SAATEG, Image Intelligence Deep in the Deployment Area) deployment in Afghanistan. Germany will continue to lease Heron 1 UAVs for the mission until the end of May next year, after which they will be replaced by Heron TPs.

■ Republic of Srpska set for Ansat

The Republic of Srpska, one of the two entities of Bosnia and Herzegovina, will reportedly become the first European customer for Russian Helicopters' Ansat utility aircraft. The country's interior ministry is expected to acquire three Ansats as part of a package worth €21.3m. One will be configured for emergency medical services and the other two for law enforcement. Deliveries are scheduled for 2021 and 2022.

■ TALIOS on board Charles de Gaulle

The French Navy Rafale M's new-generation Talios laser designation pod has been embarked on the aircraft carrier *Charles de Gaulle* operating in the eastern Mediterranean. The jets began to carry the pod as part of the carrier strike group's Mission Foch on February 28, in advance of formal operational commissioning.

Hawk Strike 2020

Exercise Hawk Strike 2020 brought together armed forces from the US and Hungary in a series of events designed to increase operational effectiveness between the two nations, as **Tamás Martényi** reports.



Above: HH-60M serial 14-20679 is assigned to C Company, 2nd General Support Aviation Battalion, 3rd Aviation Regiment 'Dustoff'. Left: A Mi-24P of the Phoenix Attack Helicopter Battalion from Szolnok provides top cover. All photos Tamás Martényi

US and Hungarian troops were deep into Exercise Hawk Strike when the coronavirus pandemic erupted across Europe. This included Steppe Archer, held at the Újdörög exercise area in western

Hungary in early March as part of this biennial umbrella event. On this occasion, it was scheduled to run from February 24 to mid-April.

Hawk Strike 2020 was spearheaded by the US Army's 1st Battalion, 8th Cavalry

Regiment, 2nd Armored Brigade Combat Team 'Mustang' from Fort Hood, Texas. The exercise is designed to enable units to conduct training in a realistic, high-intensity environment, to ensure readiness for combat and

the ability to fully integrate with any NATO partner, such as the Hungarian Defence Forces. The events teamed deployed US Army forces with the US Army Europe (USAREUR) and Hungarian troops, further strengthened by the air assets of the 3rd Combat Aviation Brigade (3rd CAB) from Hunter Army Airfield (AAF) in Georgia, including the 2nd General Support Aviation Battalion (GSAB) – 2-3rd AVN 'Knighthawks'. On the Hungarian side, the 2nd Bertalan Árpád Special Operations Brigade, MH 86. Szolnok Helicopter Base rotary assets, the Bakony Combat Training Centre and the 5th Bocskai István Infantry Brigade were heavily involved.

A huge air assault exercise on March 5 involved a 'hybrid, asymmetric environment to strengthen the state border'. This provided a good opportunity to meet the training objectives for both nations, while streamlining tactics and understanding different methods of operation. The success of an air assault is measured through the co-ordinated, accurate and rapid attack of infantry units on the ground and air support forces using combat helicopters. Its purpose is to take and hold a particular area, as was evidenced at the large media event that surrounded Steppe Archer.

The raid at Újdörög was staged out of Szolnok and was used to align tactics with the Hungarian forces, providing variety and experience in an unfamiliar environment. **AFM**

Air assault in Hungary



A CH-47F of Heavy Helicopter Company Bravo (B/2-3rd AVN) mounts an assault alongside a UH-60L.



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Nighthawk is back



Toshihiko Shimizu

AFTER A lull in appearances, the USAF's F-117A returned to the Mojave Desert recently, where the closest public encounter was recorded in more than a year. Photographer Toshihiko Shimizu captured this

Nighthawk on March 19, operating in almost the same area as the aircraft was spotted last February near Death Valley (see *Possible new Nighthawk squadron identified*, May 2019, p16). However, the aircraft was not flying as

low on this latest occasion. Shimizu said: "At 9.36am, I found a black shadow in the sky. After I looked through my camera, I found it was an F-117. It came from [the] south, then turned right and headed north. Five minutes later, it came

back from [the] south again, and flew the same course. At 10.27, it came back again from the south. It seemed to fly the same course. After that, it didn't come back again." The USAF officially retired the F-117A in 2008 and the

52 aircraft were placed into storage, but the stealth fighter has remained active, with periodic appearances in the military operating areas of southern California and Nevada flown from the Tonopah Test Range.

'Viper' training continues despite COVID-19



Nate Leong

USAF F-16D 84-1324 'LF', assigned to the 309th Fighter Squadron 'Wild Ducks' – part of the 56th Operations Group – returns to Luke Air Force Base, Arizona, after a mission on March 6, just before graduation of the latest Basic (B) course on March 18. Most USAF bases have reduced flight schedules as a result of the coronavirus, with reports that the Wisconsin Air National Guard is down to two flights of four aircraft per day. The 309th FS is reportedly considering delaying the next B-course class.

First F-35A for Alaska Air National Guard

THE INITIAL F-35A destined to operate from Eielson Air Force Base, Alaska, took to the air at Naval Air Station Fort Worth, Texas, on March 10. Serial 18-5345 'AK/354 OG' is due to serve with the 356th Fighter Squadron (FS), which was reactivated in October 2019.

Lt Col James Christensen, commander of the 356th FS, said at the time: "The 356th FS is reactivating to bring F-35As out to the Pacific [theatre]. We are strategically

placed here in Alaska to prepare and project fifth-generation stealth fighter capabilities, working with our [programme] partners and allies in the Pacific and to be ready, if called, to deploy around the world."

The 356th FS is the first of two new Lightning II squadrons to take residence at the Alaskan base. A total of 54 F-35As are to be based there.

The first aircraft was expected to arrive at Eielson AFB in April.



Henry B Ham

'MiG-killer' F-16C on Haboob Havoc



Nate Leong

THE SIXTH edition of the Haboob Havoc exercise had a 'star' participant in USAF F-16C 86-0262 'SA'. The aircraft, credited with a 1993 Iraqi Air Force MiG-23 kill, is seen here in its new Gunship Gray colour scheme as it returns to Luke Air Force Base, Arizona, after

a late-afternoon dissimilar air combat training (DACT) mission against Royal Canadian Air Force (RCAF) CF-188s in late February.

Twelve F-16C/Ds assigned to the 149th Fighter Wing's 182nd Fighter Squadron, from Joint Base San Antonio-Lackland, Texas, flew to

Luke en masse for a Coronet Cactus training deployment. This happened to coincide with the annual Haboob Havoc exercise, for which the RCAF also deployed 12 CF-188s from 433 Tactical Fighter Squadron to Luke for three weeks of DACT and asset integration (see

CF-188s train with Lightnings at Luke, March, p17). Locally based F-35s, F/A-18s from the US Navy's Air Test and Evaluation Squadron Nine (VX-9) and F-16CMs from the 20th Fighter Wing at Shaw AFB, South Carolina, also participated in the manoeuvres.

Milestone for first USMC F-35C squadron

MARINE FIGHTER Attack Squadron 314 (VMFA-314) received its Safe-For-Flight Operations Certification (SFFOC) two months after its first F-35C arrived at Marine Corps Air Station Miramar,

California. The first Lightning II carrier variant for the 'Black Knights' touched down at Miramar on January 21 and certification followed on March 20. VMFA-314 worked with the US Navy's F-35C

fleet replacement squadron, Strike Fighter Squadron 125 (VFA-125) 'Rough Raiders' to achieve the certification.

It marks the end of the squadron's oversight by VFA-125, which provided

conversion training during VMFA-314's temporary relocation to Naval Air Station (NAS) Lemoore, California, from last September to January this year.

The SFFOC process ensures the squadron's personnel are qualified to implement maintenance and safety programmes in support of fleet operations. All transitioning squadrons are required to complete it before independently conducting flight operations.

Left: A VMFA-314 F-35C from NAS Lemoore flown by Capt Tommy Beau Locke from VFA-125 in formation with a VFMA-314 F/A-18A++ piloted by unit commander Lt Col Cedar Hinton, before last year's retirement of the Hornet from 'Black Knights' service. US Navy/LCDR Darin Russell



EMARSS visits Farnborough Airport

A RARE US Army MC-12S EMARSS-S aircraft, serial 11-00268 (c/n FL-738), transited through Farnborough Airport, Hampshire, on March 9. The EMARSS (Enhanced Medium Altitude Reconnaissance and Surveillance System) aircraft flew from Naval Air Station Rota in Spain, to Santiago de Compostela Airport, before arriving at Farnborough. It is understood to be attached to the 224th Military Intelligence Battalion based at Hunter Army Airfield in Savannah, Georgia.



Ian Harding

US Army adds to UH-60M and UH-72A orders

THE US Army has ordered 38 additional UH-60M Black Hawks and 15 extra UH-72A Lakotas in two separate helicopter contracts. The first deal, awarded to Airbus Helicopters by US Army Contracting Command on March 3, covers procurement of 15 UH-72As.

The order is valued at US\$122,655,293 and modifies a previously awarded Lakota contract. Financing is from Fiscal Year 2018 US Army procurement funds and the contract's estimated completion date is August 31, 2022. The additional helicopters, in a baseline training configuration, bring total US Army procurement of the type to 481.

On March 10, US Army Contracting Command awarded a US\$525,371,067 contract modification to Sikorsky Aircraft to exercise an option for the Army Multi-Year IX Programme Year 4, Lot 44, requirement for 38 UH-60Ms. The estimated contract completion date is June 30, 2022. Financing comes from FY 2010 special and FY 2020 aircraft procurement funding.

The deal also exercised an option for two 'green' UH-60Ms for Foreign Military Sales, although the customer involved was not identified. While there are several possible candidates, Croatia is one of the most likely, having received US State Department approval for purchase of two UH-60Ms last October (see *In Brief*, December 2019, p15).

The Lot 44 deal exercises options from the original Multi-Year IX Programme contract awarded to Sikorsky on June 30, 2017, covering Lot 41 production, which comprised 257 UH-60M/HH-60Ms (including FMS orders), plus options on a further 103. This was followed by a Lot 42 production contract on November 30, 2017, and a Lot 43 order on December 5, 2018. The number of planned US Army UH-60M/HH-60Ms currently stands at 1,375, the last of which are scheduled to be funded in FY 2028. **Dave Allport**

Spirits back at Fairford



B-2A 88-0332 'Spirit of Washington' arrives at RAF Fairford. Peter R Foster

USAF may get F/T-7X for fighter pilot training

THE USAF plans to operate Lockheed Martin/Korea Aerospace Industries (KAI) T-50A trainers under contract for its Reforge Proof of Concept (RFX) programme. Air Combat Command (ACC) said it intends to award Texas-based Hillwood Aviation a sole-source contract for between four and eight advanced trainers. The aircraft – to be designated F/T-7X – would be stationed at Langley Air Force Base, Virginia.

According to the notification, "ACC [has] drafted a concept of operations to rebuild the current fighter training forge (Reforge CONOP) employing an F/T-7X, ACC variant of the T-7, in a 12-month focused training programme. The CONOP deliberately develops and experiences fighter aviators with relevant tactical skills prior to their fighter's Formal Training Unit (FTU). Reforge pilots will be eligible for the FTU/Track-1 course, taking about half as long as the Basic course."

The new aircraft is required to have similar capabilities to the T-7A Redhawk and will provide approximately 3,000 sorties/4,500 flight hours annually for five years.

THREE USAF B-2As arrived at RAF Fairford, Gloucestershire, on March 12, for the Bomber Task Force 20-2 rotation. The Spirits from the 509th and 131st Bomb Wings at

Whiteman Air Force Base, Missouri, were 82-1068 *Spirit of New York*, 88-0332 *Spirit of Washington* and 82-1070 *Spirit of Ohio*, which arrived in that order using the callsigns

'Misty 11, 12 and 13'. The last two bombers touched down in the UK after a flight from Lajes in the Azores. On their way, they carried out training over the Tain range,

in the north of Scotland, before arriving at Fairford at about 1430hrs. They were preceded mid-morning by 82-1068, which flew direct from Whiteman AFB.

Illinois Air Guard Hercules in the UK

A PAIR of C-130Hs from the Illinois Air National Guard's 182nd Airlift Wing (AW) visited RAF Mildenhall, Suffolk, on March 10. The

airlifters, serials 94-6701 and 93-2042 using the callsigns 'RCH210' and 'RCH209' respectively, departed Mildenhall

the following day. The 182nd AW's 169th Airlift Squadron is stationed at Peoria Air National Guard Base, Peoria, Illinois.



C-130H 94-6701 prepares to depart RAF Mildenhall on March 11 after a night stop. Peter R Foster

Last West Coast flight for AH-1W



USMC/Lance Cpl Alison Dostie

US MARINE Corps AH-1W SuperCobra 163945 'RW-25' and AH-1Z Viper 169514 'RW-46' (nearest camera) from Marine Light Attack Helicopter Squadron 775 (HMLA-775) 'Coyotes' fly along the Southern California coast during a 'Whiskey Sundown' event on March 13. This was the last flight by the AH-1W 'Whiskey' variant on the West Coast. The mission took place out of Marine Corps Base Camp Pendleton, California, the home of HMLA-775.

The unit's AH-1Ws have now been replaced by the AH-1Z, the first example of which was received last November 18. The squadron is part of Marine Air Group 41 and was the last at Camp Pendleton to transition to the Viper.

VMM-362 reaches FOC with MV-22B

FOUR MV-22Bs assigned to Marine Tiltrotor Squadron 362 (VMM-362) 'Ugly Angels' approach a simulated weapons engagement zone during an air assault in support of 1st Battalion, 3rd Marine Regiment, at Marine

Corps Base Camp Pendleton, California, on February 26. This culminating event signified that VMM-362 had reached full operational capability (FOC) following its reactivation in 2018. The squadron is based at

Marine Corps Air Station Miramar in California as part of Marine Aircraft Group 16, 3rd Marine Aircraft Wing.

First activated as a UH-34D squadron in 1952, VMM-362 was reactivated at Miramar on August 17, 2018, having been

stood down on November 30, 2012, at Marine Corps Base Kaneohe Bay, Hawaii, after the service retired the CH-53D Sea Stallion. The 'Ugly Angels' were previously intended to be the first unit to re-equip with the CH-53K King Stallion.



USMC/Lance Cpl Julian Elliott-Drouin

VMM-161 Ospreys reinforce Baghdad Embassy Compound

US MARINES with Marine Medium Tiltrotor Squadron 161 (VMM-161), assigned to the Special Purpose Marine Air-Ground Task Force – Crisis Response – Central Command (SPMAGTF-CR-CC) 19.2, land an MV-22B at the Baghdad Embassy Compound in Iraq, on February 29. The

SPMAGTF-CR-CC is a quick reaction force, able to respond to various situations across the region. Initially around 100 marines from the 2nd Battalion, 7th Infantry Regiment were assigned to the SPMAGTF-CR-CC from Kuwait, to reinforce Baghdad's US Embassy after swarms of

protesters stormed the gate last December, following US air strikes against Iraq. The protesters were unable to breach the main compound.

Meanwhile, US forces have been vacating other key operating bases in the country. US Army CH-47s took part in the withdrawal

from Al Qaim base near the Syrian border on March 17, relocating to undisclosed sites in Iraq. US troops are also set to leave other Iraqi locations, including K-1 air base in Kirkuk and Qayyarah West near Mosul; the latter had supported USAF C-17 and C-130 airlift operations.



USMC/Sgt Branden J Bourque

US Army 82nd CAB UH-60Ls deploy to Kenya

A US Army 82nd Combat Aviation Brigade (CAB), 3rd Battalion UH-60L, performs a test flight over Moi International Airport, Mombasa, Kenya on March 1. The unit's Black Hawks are in Kenya supporting ongoing US operations at the Kenya Defence Forces installation Camp Simba at Manda Bay Airfield. The helicopters were airlifted to Moi on board USAF C-17A transports. The base was reinforced following an attack in the early hours of January 5 by al-Shabaab, an al-Qaeda-affiliated group in East Africa. Images of the aftermath revealed the destruction of a Dash 8

Srs 202 STAMP, registered to US Special Operations Command (SOCOM). Another of the aircraft lost was a King Air 350, modified for intelligence, surveillance and reconnaissance and

operated under contract to the US military by L3Harris Technologies. It was taxiing across the ramp when it was hit by a rocket-propelled grenade fired by the al-Shabaab fighters,

killing two pilots, while a third contractor was injured. One other US service member died, and five of the terrorists were killed by multi-agency forces that were repulsing the attack.



USAF/Tech Sgt Christopher Ruano

In Brief

■ Latest Poseidon contract

A long-lead contract has been awarded for 18 Lot 11 P-8As, comprising eight for the US Navy, six for South Korea and four for New Zealand. Placed by Naval Air Systems Command, the deal is worth US\$800m.

■ Additional UC-12W for US Marine Corps

Naval Air Systems Command has ordered another UC-12W Huron utility transport from Textron Aviation. The US\$14.3m contract covers production and delivery of one King Air 350C Cargo Slick aircraft modified to UC-12W standard; it will join eight already in use with the US Marine Corps. Work is expected to be completed next March.

■ Next-Gen Jammer Mid-Band pod completes developmental testing

The US Navy's Next Generation Jammer Mid-Band (NGJ-MB) developmental pod for the EA-18G has completed a portion of evaluation at the Air Combat Environmental Test and Evaluation Facility anechoic chamber at Naval Air Station Patuxent River, Maryland.

■ JSTARS deploys to Saudi Arabia

An E-8C Joint Surveillance Target Attack Radar System (JSTARS) aircraft assigned to the 7th Expeditionary Airborne Command and Control Squadron at Al Udeid Air Base, Qatar, has forward deployed to Prince Sultan Air Base (PSAB) in Saudi Arabia. Under the 378th Air Expeditionary Wing, PSAB has recently supported USAF combat aircraft including the F-15E, F-16C, F-22A and F-35A.

■ New 'Air Force One' begins modification

The USAF has begun work to convert the first of two Boeing 747-8s under the Presidential Aircraft Recapitalization (PAR) programme. Modification of the second aircraft will begin later this year and the two VC-25Bs are scheduled to replace the service's current pair of VC-25A (747-200) aircraft in 2024.

■ Dyess or Ellsworth to receive first B-21s

The USAF will soon begin environmental impact studies connected with basing the new B-21 Raider bomber at Dyess Air Force Base, Texas, and Ellsworth AFB, South Dakota.

Su-57 launches close-air combat AAM

A VIDEO released by Russia's defence ministry on March 25 showed, for the first time, a Su-57 fighter launching a close-air combat air-to-air missile (AAM) from a small weapons bay located at the wing-root section. The low quality of the footage means it's not possible to identify which particular Su-57 was used for the tests. It's also unclear whether the images show a new R-74M2 missile or the 'legacy' R-73 or R-74M AAM; launching an older missile would be possible if the weapon bay's cover were not closed.

The Vympel R-74M2 missile (or more precisely, its K-74M2 test version, internal code izdeliye 760) was first launched on April 8, 2016, but it's not known if it was fired from a Su-57 or another aircraft. On July 26 last year, the missile completed initial tests and was submitted for state evaluation on the Su-57. Russian AAMs receive

designations with the letter 'R' following official acceptance for service; during the test stage they use the letter 'K'.

The R-74M2 was developed specifically for the Su-57. The missile's cross-section is reduced to 12.6 x 12.6in (320 x 320mm), for carriage inside the fighter's internal 'quick launch' weapons bays. These are in the form of rectangular underwing fairings, close to the fuselage, each accommodating a single R-74M2 launched from a VPU-50 rail. Moreover, the R-74M2 has a new seeker and improved 516-1M rocket motor offering increased specific impulse and longer burn time. Due to its inertial flight control system with radio data link for mid-course correction (absent on the previous R-73 and R-74 missiles), the weapon can be fired in lock-on-after-launch (LOAL) mode, beginning its flight under inertial control before achieving an in-flight lock-on. **Piotr Butowski**



A Su-57 launches an unidentified AAM, in an image taken from a Russian defence ministry video. Russian MoD

Refurbished Tu-95MS flown at Taganrog

ANOTHER RUSSIAN Aerospace Forces Tu-95MS bomber has completed major refurbishment and repair at Beriev's facility in Taganrog. After completion, the aircraft was re-flown on

March 10. It was then due to undergo the standard factory post-overhaul flight tests prior to being returned to service.

Once evaluation is completed, the *Bear-H*

will be handed over to a Long-Range Aviation crew to be flown back to its permanent base.

Completion of the aircraft came only a matter of weeks after Beriev had

test flown a Russian Navy Tu-142MZ after undertaking an overhaul and life-extension programme (see *Russian Navy Tu-142MZ redelivered after overhaul*, March, p20). **Dave Allport**



The newly overhauled Russian Aerospace Forces Tu-95MS takes off from Taganrog for its first test flight after completion of major refurbishment and repairs. UAC

Il-76s fly bombing missions in Tver

IMAGERY PUBLISHED by the Russian defence ministry on March 2 showed military transport aviation crews completing bombing and live-fire drills using Il-76MD airlifters at a training ground near Tver. The *Candid*s flew day and night missions from Migalovo air base, home of the Russian Aerospace Forces' 12th Military Transport Aviation Division (12 VTAD). The division includes five

squadrons of Il-76s, of which two are at Migalovo and assigned to the 196th Military Transport Aviation Regiment (196 VTAP). The Il-76MD has a latent conventional bombing capability, with provision for up to four 500kg (1,102lb) bombs carried under the wing. Typical stores include flare bombs for illumination of landing areas, as well as small 50kg (110lb) P-50T practice bombs for training.



Russian MoD

Russian Candid's assist in Italy

RUSSIAN MILITARY specialists and equipment were transported to Italy to assist in the fight against the coronavirus on March 22-23. The Il-76MD military transports of the Russian Aerospace Forces' 223rd Flight Detachment based at Chkalovsky near Moscow landed at the Italian Air Force base of Pratica di Mare, southwest of Rome. The aircraft delivered eight medical teams composed of military virologists and epidemiologists, as well as equipment for diagnosis and disinfection.

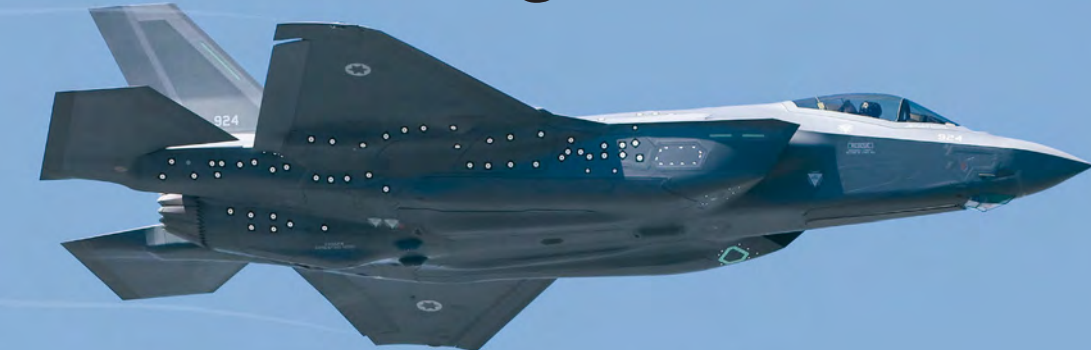
Responding to Russian media criticisms that sending assets to Italy would adversely affect the combat readiness of the radiation, chemical and biological defence (RKhBZ) troops in Russia itself, the head of the force, Lieutenant General Igor Kirillov, said that only one of 15 laboratories was sent to Italy, together with 20 special processing vehicles from a total of 2,065, and 66 personnel from around 20,000 in RKhBZ service. At the same time, according to Kirillov, "the Russian servicemen will gain a lot of experience in eliminating the consequences" of the epidemic. **Piotr Butowski**

In Brief

■ **Northern Fleet practises aerial refuelling** MiG-31BM and Su-24MR crews from Russian Naval Aviation's 98th Independent Composite Aviation Regiment (98 OSAP) based at Monchegorsk recently undertook air-to-air refuelling from a Russian Aerospace Forces Il-78 tanker. The training mission involved more than 20 Northern Fleet crews flying both as single aircraft and as part of a group.

■ **Black Sea Fleet pilots train on Ka-31R** Pilots assigned to Russian Naval Aviation's Black Sea Fleet have begun training flights on the Ka-31R airborne early warning and control (AEW&C) helicopter. The syllabus was carried out by the 859th Combat Training and Flight Crew Conversion Centre of Naval Aviation (859 TsBP PLS MA) at Yeysk.

Dedicated Israeli trials F-35A makes first flight



Photographed during its maiden flight, F-35A serial 924 already has telemetry test markings liberally applied along three-quarters of the length of the fuselage. Henry B Ham

LOCKHEED MARTIN has flown a one-off F-35A specifically built as a trials aircraft for the Israeli Air Force (IAF). Serial 924 (c/n AS-15, FMS 15-5232), which is a sub-variant of

the Israeli F-35I Adir, made its maiden flight from Fort Worth, Texas, on March 4.

Israel has ordered 50 F-35Is, but unlike the remaining aircraft, this one is not intended for

operational service and will remain in use as a dedicated test machine. It will be operated by the IAF's Flight Test Centre, also known as MANAT (its acronym in Hebrew) and

previously designated as 601 Squadron, at Tel Nof Air Base. The unit undertakes aircraft and weapons trials, avionics integration and airframe modification and testing. **Dave Allport**

US approves sale of eight KC-46As to Israel

ISRAEL HAS been cleared to buy Pegasus tankers after US State Department approval was announced on March 3. The US Defense Security Cooperation Agency disclosed the approval, noting that Israel has been authorised to buy up to eight KC-46As and related equipment for an estimated cost of US\$2.4bn. Acquisition of the Pegasus would enable the Israeli Air Force (IAF) to retire its ageing 707-300 Re'em (eight) and KC-130H (four) aerial refuellers. If the deal goes through, Israel may seek to take two USAF production slots, to expedite initial deliveries of the KC-46.

Latest Dubai Police AW139 under test

THE THIRD AW139 on order for the Dubai Police began test flights from the Leonardo Helicopters plant in Vergiate, Italy, in January. The helicopter has been allocated the temporary test registration I-EASM, but will become DU-203 once delivered.

The Dubai Police Headquarters formally inducted the AW139 into service during last year's Dubai Airshow. Dubai Police AW139 DU-202 was on static display at the event.

Detailed information regarding the order has not been made public, but at least three AW139s have been ordered to replace the ageing

fleet of three A109K2s in service since late 1995. Serials allocated to the AW139s are DU-201 to DU-203, previously used by the A109s.

The Dubai Police AW139s are equipped with an electrical rescue hoist with a 600lb (272kg) lift capacity, a Traffic Collision Avoidance System II (TCAS II), high-definition forward-looking infrared/low-light TV (FLIR/LLTV), a Trakka Systems searchlight and a search/weather radar. They are expected to conduct a wide variety of missions including surveillance, traffic control, transport of critical-care patients, and search and rescue. **Marco Muntz**



Above: Dubai Police AW139 DU-203 wearing temporary test registration I-EASM on final approach to Venegono on January 29 during one of its first test flights. Marco Muntz

Saudi Royal Flight L-100 in Malta



Above: Saudi Royal Flight L-100-30 HZ-128 at Malta International Airport on March 11. Ruben Zammit

ROYAL SAUDI Air Force (RSAF) L-100-30 HZ-128 (c/n 4950) from 1 Squadron, the Saudi Royal Flight, was involved in supporting the

Saudi Hawk display team on their transit back from the International Aerospace & Defence Exhibition (IADE) held at Djerba Airport in

Tunisia from March 4 to 8 (see also p94-96). The Hercules is part of 1 Wing at Riyadh-King Salman Air Base, where it operates as

part of a mixed fleet that also includes examples of the 737, 747, A318, A340, AS-61 Sea King, AW101, BAe 125, Learjet 35A and VC-130H.

In Brief

Fifth batch of Rafales delivered to Qatar

The latest delivery of Rafales for the Qatar Emiri Air Force (QEAF) left Bordeaux-Mérignac in France for Qatar on February 25. The aircraft in the fifth batch were twin-seat Rafale DQ QA206 and single-seat Rafale EQs QA215 and QA227. The three jets stopped at Souda Bay in Greece and Incirlik in Turkey en route. They were accompanied by a QEAF C-17A. Only one more Rafale DQ is to be delivered to complete the first batch of orders.

Unique Dominican Republic Tecnam in the US



Martin Kaye

THE SOLE Tecnam P2006T in service with the Fuerza Aérea de República Dominicana (FARD, Air Force of the Dominican Republic) was spotted at Smyrna Airport, Georgia,

on February 27, perhaps during scheduled servicing or integration of further role-specific equipment. Serial 1548 (c/n 160/US, ex N160TU) was the first Special Mission Platform

(SMP) variant acquired by a military operator and the manufacturer announced its purchase in September 2015. The aircraft was handed over in early 2016 and is used for maritime

surveillance operations as part of the Dominican Republic's counter-drug trafficking efforts. The operating unit is the Escuadrón de Combate at Base Aérea San Isidro.

Brazilian Navy inducts first H135M

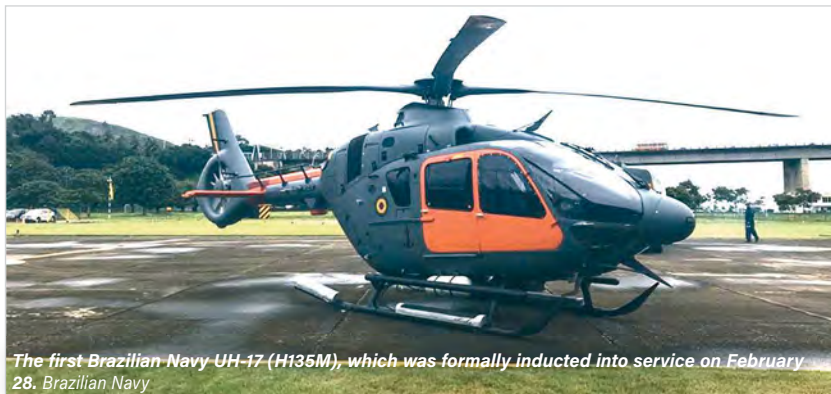
DELIVERY OF the first of three H135Ms to the Marinha do Brasil (Brazilian Navy) has been completed. The helicopter, N-7090, which will use the local designation UH-17, was handed over by Helibras during a ceremony on February 28. It will be stationed at Base Aérea Naval de São Pedro da Aldeia, where it will be operated by the 1º Esquadrão de Helicópteros de Emprego Geral (1st General Purpose Helicopter Squadron) 'Esquadrão Águia' – or HU-1, as it is more commonly known. The type is replacing the remaining Helibras UH-13 Esquilo (AS355F2 Ecureuil 2) helicopters currently operated by the unit. As previously reported, the aircraft had been shown publicly for the first time during the 103rd anniversary of Brazilian Naval Aviation celebrations at São

Pedro da Aldeia last August (see *First Brazilian Navy H135 unveiled*, November 2019, p22), but was still undergoing acceptance tests at that time and had not been delivered.

A €25.49m contract for the three UH-17s was signed with Airbus Helicopters' Brazilian subsidiary, Helibras,

on February 20 last year (see *In Brief*, April 2019, p19). The deal also includes training and a five-year support package. Although not built locally, the 'green' airframes are being outfitted in Brazil by Helibras at its Itajubá facility. They will be used for a variety of

missions, including personnel transport, search and rescue, aeromedical evacuation, cargo transport and vertical replenishment. The acquisition forms part of a broader strategic programme to modernise the navy's helicopter fleet and replace older types. **Dave Allport**



The first Brazilian Navy UH-17 (H135M), which was formally inducted into service on February 28. Brazilian Navy

Mexican Navy T-6C+ takes part in NAMSII exercise

PERSONNEL FROM the Armada de México (Mexican Navy) and US Coast Guard Air Station Sacramento with a Fuerza Aeronaval (FAN, Mexican Naval Aviation) T-6C+ at Base Aeronaval de La Paz, La Paz International Airport, Mexico. The coast guard crew were participating in a North American Maritime Security Initiative (NAMSII) exercise in early March. NAMSII is a tri-national effort involving forces from Canada, Mexico and the US to improve

operational co-ordination.

A contract for the first two FAN Texan IIs was announced in March 2014 and both were handed over at Beechcraft's facility in Wichita, Kansas, on August 20 that year, commencing their delivery flight the same day. Thirteen had been delivered by early 2017 and these serve with Escuadrón Aeronaval 111 at Tampico, Escuadrón Aeronaval 212 at La Paz and Escuadrón Aeronaval 512 at Chetumal.



US Coast Guard/Petty Officer 2nd Class Logan Schindler.

Uruguayan Police Force takes delivery of Robinson R66 Turbine

A BRAND-NEW Robinson R66 Turbine has been delivered to the Policía Nacional de Uruguay. The helicopter, CX-MIE, was formally inducted into service during a ceremony in the Unidad Aérea de la Policía Nacional (National Police Air Unit) hangar at Montevideo-Carrasco International Airport on February 13. The event was attended by the Minister of the Interior, Eduardo Bonomi, along with members of the cabinet. Acquired direct from the manufacturer at a cost of \$1.2m, the R66 includes an external cargo hook with a 660lb (300kg) carrying capacity.

The new addition brings the fleet of the Dirección General de Aviación de la Policía Nacional (General Directorate of Aviation of the National Police) to five. The R66 joins three Robinson R44 Raven II helicopters – CX-MIA (c/n 13538), CX-MIB (c/n 13945) and CX-MIC (c/n 13946) – which were officially introduced on December 28, 2016. The fleet also includes Cessna 182Q Skylane II CX-BKW (c/n 182-67221), the only fixed-wing aircraft currently operated.

A few days after the R66 entered service, the fleet was expected to be supplemented with a sixth aircraft, a Cessna 210 Centurion. This had been seized from drug-runners by the Dirección General de Represión al Tráfico Ilícito de Drogas (Directorate for the Suppression of Illegal Drug Trafficking) and assigned to the Policía by the Junta Nacional de Drogas (National Drug Board). It will enter service once re-certification is completed.

The police air unit is still in its infancy, having only been officially created on May 5, 2015, but is now expanding after it received a large funding boost to buy weapons, armoured vehicles, aircraft and other equipment to help combat the rapidly rising wave of crime in the country. **Dave Allport**

Côte d'Ivoire *Hips* on delivery



Mi-8P TU-VHN was one of two aircraft that passed through Palma de Mallorca on its delivery flight to the Côte d'Ivoire. Javier Rodríguez

THE CÔTE d'Ivoire (Ivory Coast) has taken delivery of a pair of second-hand Mi-8P *Hip* medium-lift transport helicopters. The two aircraft destined for the Côte d'Ivoire Armée de l'Air (Côte d'Ivoire Air Force) made a refuelling

stop at Palma de Mallorca Airport, Spain on their delivery flight in mid-March. The aircraft – registrations TU-VHL and TU-VHN – will be operated by the Groupe Aérien de Transport et de Liaison (Air Transport and Liaison

Group) at Base Aérienne de Abidjan/Port-Bouët at Abidjan/Félix-Houphouët-Boigny International Airport. These Mi-8Ps are second-hand VIP transports, produced before 1993. The Ivory Coast's Escadrille Présidentielle

operated a single Mi-17 *Hip-H* in the role until it was damaged following a collision with Mi-24D TU-VHR on November 27 last year (see *Attrition*, January, p89). The Mi-17 was placed in storage after the incident.

Eswatini receives UH-1Hs from Taiwan

FORMERLY KNOWN as Swaziland, Eswatini has taken delivery of a pair of UH-1H helicopters donated by Taiwan.

The two aircraft were formally handed over to the Umbutfo Eswatini Defence Force (UEDF) Air Wing on February 21 by Taiwan's deputy defence minister Chang Guan-chung, after they arrived in the country earlier that month.

The 'Hueys' were received by King Mswati III at the Lozitha Royal Palace outside Lobamba.

Five UEDF Air Wing pilots and five ground technicians have been trained by Taiwan to operate the new helicopters. The UH-1Hs are expected to be used for missions including disaster relief and medical evacuation, as well as in support of the police.

Taiwan decommissioned its final UH-1Hs last October 30 (see *Taiwanese 'Huey' retired as UH-60M declares FOC*, December 2019, p26). The Aerospace Industrial Development Corporation (AIDC) signed an agreement with Bell to assemble 118 UH-1Hs for the Republic of China Army on August 13, 1969.

Mauritanian A-29B in Exercise Flintlock

THE FORCE Aérienne Islamique de Mauritanie (Mauritanian Islamic Air Force, MIAF) took part in the recent Exercise Flintlock 20, US Africa Command's largest annual special operations forces exercise. Among the aircraft involved were the four MIAF A-29B Super Tucanos, outfitted for counter-insurgency work and based at Atar. A Mauritanian

order for an undisclosed number of Super Tucanos was officially announced in March 2012. It's believed the first pair of A-29Bs was officially accepted by the MIAF on October 19, 2012, during an official ceremony at Embraer's facility in Gavião Peixoto, Brazil and these were then delivered to Mauritania by mid-December 2012. The second pair of aircraft had

arrived by February 2020. The MIAF also operates three former French Air Force EMB-312F Tucanos, survivors from five delivered from September 2010.

Taking place since 2005, Flintlock is an annual exercise involving military and law enforcement agencies and intended to strengthen allied forces throughout North and West Africa.



A press photographer documents a Mauritanian soldier preparing A-29B serial 192/ST-MAW at Atar during Flintlock 20 on February 18. USAF/Staff Sgt Brycen Guerrero

Belarusian drones for Egypt

BELARUSIAN STATE press agency Belta quoted the president of the Academy of Sciences of Belarus, Vladimir Gusakov, in announcing that Belarusian UAVs will be operated by and manufactured in Egypt. Gusakov said: "We held talks with Egyptian partners and agreed on a good contract – [worth] about US\$1m." This is said to cover supply of an initial batch of drones, followed by local production and training of specialists.

Several Belarusian UAVs were presented at a recent exhibition in New Cairo, which

was attended by presidents of both countries, Alexander Lukashenko and Abdel Fattah el-Sisi, on February 20. The largest of the UAVs is the reconnaissance-and-combat Burevestnik MB developed by

the Centre for Multifunctional Unmanned Systems of the Academy of Sciences of Belarus. An unarmed Burevestnik prototype was first flown in November 2015. **Piotr Butowski**



Above: A Burevestnik MB on display in Belarus. The 772lb UAV can remain aloft for four to eight hours and can carry two specially made loitering munitions, each weighing 55-66lb. Alternatively, it can be armed with unguided 57mm rockets. Piotr Butowski

Tunisia signs contract for Anka-S UAVs

TUNISIA HAS ordered six Anka-S unmanned aerial vehicles (UAVs) from Turkish Aerospace to become the type's first export customer. The manufacturer was competing with local rival Baykar Makina to supply the Tunisian military with drones and was selected last December. The deal for six Anka-S aircraft was finalised in January after a visit by Turkish President Recep Tayyip Erdoğan. The contract reportedly covers three systems each comprising two aircraft and a ground control station and is worth around US\$240m in total. Turkish Aerospace is reportedly discussing the possibility of local assembly of the aircraft in Tunisia.

In Brief

■ **NAF Thunders to be delivered in November**
Nigerian Air Force chief Air Marshal Sadique Abubakar has confirmed that the service will receive its first JF-17 fighters this November. An initial three jets are on order. Abubakar also noted that negotiations are under way to introduce the first of 12 A-29 Super Tucanos to service by 2022.

■ **Brazil reportedly to sell six Mi-35s to Libya**
French media is reporting the possible sale of six of the 12 Brazilian Air Force Mi-35Ms (AH-2 Sabres) to the Libyan National Army (LNA). If the deal goes through, the attack helicopters would be sold back to Rosoboronexport and their purchase for the LNA would be funded by the United Arab Emirates.

■ **Morocco receives three Harfang UAVs from France**
Three former French Air Force Harfang (Heron 1) unmanned aerial vehicles have entered service with the Royal Moroccan Air Force's 2ème Escadron de Transport at Kénitra. The drones were ordered from Dassault as long ago as 2014 under a US\$48m contract but were only transferred to Morocco in January.

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Japan retires final recce Phantoms



Above: All six of the final JASDF RF-4EJ Kais remaining in service with 501 Hikotai lined up at Hyakuri for the final time on March 9. JASDF

RETIREMENT OF the last reconnaissance versions of the F-4 Phantom II in Japan Air Self-Defense Force (JASDF) service took place during a recent ceremony at Hyakuri Air Base. The March 9 event marked the final flights of the last six RF-4EJ Kai variants in service with

501 Hikotai (501st Tactical Reconnaissance Squadron), comprising 07-6433, 47-6901, 47-6903, 57-6907, 57-6909 and 67-6380. Each aircraft also carried special markings, including a diagonal band in the style of a film strip with '1981' and '2020' titles to signify the first and last

years of operations by the squadron, with an RF-86F Sabre silhouette to represent the initial type operated, plus an RF-4 silhouette. The unit had ceased training flights on March 3 but flew for one last time on March 9 to mark disbandment of the squadron. Appropriately,

the last aircraft to land was 47-6901, which had been the first RF-4E delivered to the JASDF in 1974. An official disbandment ceremony took place on March 14 but did not involve any flying. This leaves the only operational JASDF Phantom unit as 301 Hikotai, also

based at Hyakuri, operating the F-4EJ and F-4EJ Kai. Although it will continue to fly the type for a few more months, it will also lose its aircraft before the end of the year and move to Misawa, where it will become the second JASDF F-35A squadron. **Dave Allport**

First Indian Navy Poseidon with Dabolim tail markings

A NEW production Indian Navy P-8I has appeared for the first time at Boeing Field, Washington, wearing the 'DAB' tail code of Indian Naval Station (INS) Hansa at Goa-Dabolim. The Poseidon, IN328/N490DS (c/n 64890, line number 7757), was first noted with these markings on March 4. All eight of the Indian aircraft delivered up until now have carried the 'ARK' tail code, indicating their base at INS Rajali, Arakkonam, where they are flown by Indian Naval Air Squadron (INAS) 312 'Albatross'.

The 'DAB' coded aircraft is the first of a second batch of four additional P-8Is and

is expected to be delivered around May. It is scheduled to join INAS 315 'Winged Stallions' at Dabolim, which currently flies the upgraded

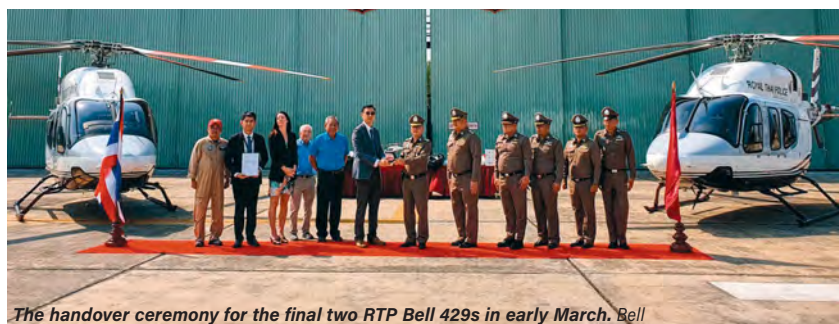
II-38SD Sea Dragon. It is believed that both types will be operated together by the unit initially, although the P-8I will eventually replace

the II-38SDs. In addition to the 12 aircraft on order, on November 28 last year India's Defence Acquisition Council approved purchase of six

more (see *India approves aircraft purchases*, January, p26), for which a contract is expected to be signed later this year. **Dave Allport**



The latest P-8A for the Indian Navy, IN328/N490DS at Seattle's Boeing Field on the evening of March 4, wearing the new 'DAB' tail code. Joe G Walker



The handover ceremony for the final two RTP Bell 429s in early March. Bell

Last two Bell 429s for Royal Thai Police

BELL HAS delivered the final two Royal Thai Police (RTP) Bell 429 GlobalRangers from an order for ten of these helicopters. The company announced the delivery on March 16, stating that the pair, serials 3209 and 3210, had been handed over during the previous week. Both are in a

dedicated emergency medical services (EMS) configuration and will be used to support various parapublic missions.

The first six RTP Bell 429s, 3201 to 3206 inclusive, had been delivered in June and July 2017. The seventh and eighth, 3207 and 3208, followed in April 2019. **Dave Allport**

Maiden flight of first FOC Tejas variant

HINDUSTAN AERONAUTICS Ltd (HAL) has flown a first example of the Light Combat Aircraft (LCA) Tejas Mk1 in its Final Operational Clearance (FOC) standard. The single-seater, serial LA-5021 (SP-21), took to the air at the HAL Airport in Bengaluru on March 17 in the hands of Air Cdre K A Muthana (ret'd), the company's chief of fixed-wing test flying; it was airborne for 40 minutes. Low-speed taxi

trials had begun on March 10. The aircraft is the first of 16 FOC-standard single-seaters scheduled to be delivered to the Indian Air Force (IAF) by 2021.

The FOC Tejas is equipped with additional features including an air-to-air refuelling probe, GSh-37 twin-barrelled gun and Rafael Derby beyond-visual-range air-to-air missile capability, and draws upon operational feedback from the LCA

Initial Operational Clearance (IOC) fleet with the IAF's No 45 Squadron 'Flying Daggers' at Sulur Air Force Station (AFS) in Tamil Nadu.

The IAF's second Tejas squadron, No 18 Squadron 'Flying Bullets', was expected to be formed at Sulur AFS in April and will be equipped with the FOC jets.

In related news, India's Defence Acquisition Council (DAC) has approved the purchase of 83 further

improved Tejas Mk1As for the IAF, at an estimated cost of US\$5.3bn. Once the DAC finalises terms with HAL, the contract will need to be approved by the Cabinet Committee on Security. The deal comprises 73 single-seat Tejas Mk1As and ten twin-seat trainers. Previous orders for 40 Tejas series-production aircraft had been placed with HAL – 16 Tejas in IOC configuration, 16 in FOC configuration and eight two-seaters.



The first FOC-standard series-production LCA, serial LA-5021 (SP-21), piloted by Air Cdre K A Muthana (ret'd), Deb Rana

Bangladeshi PT-6 on parade

BANGLADESH BIMAN Bahini (Bangladesh Air Force, BAF) PT-6 serial 2718 was one of around 25 of the piston-engine trainers noted in rehearsal at BAF Base Matiur Rahman, Jessore, on March 15 for a planned flying display to mark 100 years since the birth of the Sheikh Mujibur Rahman, the country's first president.

The BAF's 11 Squadron at BAF Base Matiur Rahman was formed in 1982 to fly the PT-6. The first batch of four aircraft was delivered

in 1977. Additional deliveries have taken place, bringing the total number to at least 50 prior to the latest batch. The Bangladesh prime

minister announced in December 2014 that 12 new PT-6s were being procured. Sightings of two previously unknown examples (2701

and 2702) in December 2016 suggests this occurred and now at least 18 refurbished secondhand examples have been identified.



Mario Flores

US Navy/Mass
Communication
Specialist Seaman
Askia Collins



JMSDF SH-60K on exercise with US Navy

JAPAN MARITIME Self-Defense Force (JMSDF) SH-60K serial 8430 (c/n 5030) assigned to the 25 Kokutai at Ōminato over the Philippine Sea on March 5. The Seahawk was operating from the US Navy's Arleigh-Burke-class destroyer USS *Mustin* (DDG 89) during the US-Japan Bilateral Advanced Warfighting

Training (BAWT) exercise. Developed as an improved version of the SH-60J, the first production SH-60K was delivered to the JMSDF in August 2005. Seventy-four had been ordered through Fiscal Year 2016 and seven more were added in the FY 2020 budget. One has been de-converted to utility-specification USH-60K.

In Brief

Royal Thai Army to use DDPM Ka-32s

The Royal Thai Army has signed an agreement to use Thai Department of Disaster Prevention and Mitigation (DDPM) Ka-32A-11BC helicopters as part of increased co-operation between the agencies. In the last week of January, the 41st Aviation Battalion deployed to Chiang Mai, accompanied by the DDPM's two Ka-32s, to fight local wildfires.

Indonesian Su-35 deal "still active"

Dmitry Shugayev, director of Russia's Federal Service for Military-Technical Cooperation (FSVTS), has said Indonesia's planned procurement of 11 Su-35 fighters is "still active", countering reports from Jakarta that the US\$1.1bn deal had been shelved.

Japan developing new air-launched anti-ship missile

The Japan Ministry of Defense's Acquisition, Technology, and Logistics Agency (ATLA) has confirmed that the country is developing a new air-launched anti-ship missile with a range of around 250 miles (400km) to arm Japan Maritime Self-Defense Force P-1 maritime patrol aircraft and replace the current Type 91.

Indonesia approves ScanEagle UAVs, helicopter upgrades

The Indonesian House of Representatives' commission on defence, intelligence and foreign affairs has approved a plan for the navy to receive up to 14 ScanEagle UAVs as well as upgrades for three Bell 412 helicopters under the US Maritime Security Initiative (MSI).

Australian Lightning IIs still at Luke



Nate Leong

ROYAL AUSTRALIAN Air Force (RAAF) F-35A serial A35-006 (15-5214), wearing No 2 Operational Conversion Unit (OCU) markings, is one of a few of the unit's

aircraft that remain at Luke Air Force Base, Arizona, together with A35-002 (12-5061) and A35-004 (15-5212). Last December the RAAF completed its F-35A

training mission at Luke and began departing the Arizona facility (see *End of RAAF Lightning II training effort at Luke*, March, p23). In future, RAAF pilots and maintainers

will train in Australia with No 2 OCU, which transitioned into an F-35A training squadron at RAAF Base Williamtown, New South Wales, in December.

Fleet Certification Period 2020 completed

THE ROYAL Australian Navy (RAN) completed its first major exercise of the year – Fleet Certification Period 2020 (FCP20) – between February 17 and March 6. FCP20 was a high-end warfighting exercise designed to certify participating warships and their crews 'ready to deploy'. Aircraft included P-8As from the Royal

Australian Air Force (RAAF) and US Navy, a Royal New Zealand Air Force P-3K and three RAN MH-60R Seahawk helicopters.

The manoeuvres took place over a three-week period off the coasts of Victoria and Tasmania and tested the RAN's ability to conduct warfighting operations centred around its Canberra-class amphibious assault

ships. As well as HMAS *Canberra*, other RAN warships involved were the Anzac-class frigates HMAS *Stuart* and HMAS *Arunta*, replenishment oiler HMAS *Sirius*, mine-countermeasures vessels HMAS *Huon* and HMAS *Diamantina*, and Collins-class submarines HMAS *Collins* and HMAS *Farncomb*. FCP20's drills included

anti-submarine and anti-air scenarios, the latter involving the RAN's new air warfare destroyer HMAS *Hobart*.

Commodore Flotillas (COMFLOT), Commodore Michael Harris, said FCP20 would further develop the RAN's ability to engage in complex and dynamic warfighting activities based around sea and air control capabilities.



Aviation support sailors wait to secure the embarked MH-60R callsign 'Nomad' on board HMAS 'Canberra' during Fleet Certification Period 2020. ABIS Jarrod Mulvihill/Commonwealth of Australia, Department of Defence

First Loyal Wingman fuselage assembly

BOEING AUSTRALIA has completed major structural assembly of the fuselage for the first of three Loyal Wingman unmanned aircraft prototypes being developed together with the Royal Australian Air Force (RAAF). As part of the Loyal Wingman – Advanced Development Program effort, Boeing's Australian subsidiary is using digital engineering and advanced composite materials in the manufacture of the 38ft (11.7m) aircraft, which is designed to use artificial intelligence to 'team' with other manned and unmanned platforms.

In all, 16 Australian firms are taking part in the rapid development effort, including BAE Systems Australia (flight control computers and navigation equipment), RUAG Australia (landing gear), Ferra Engineering (precision machine components and sub-assemblies) and AME Systems (wiring looms).

The three Loyal Wingman prototypes will provide key lessons towards production of the Airpower Teaming System (ATS), which is intended for the RAAF and export customers. The first flight of a prototype is expected before the end of the year.



Above: The first major fuselage structural assembly for the initial Loyal Wingman prototype at Boeing Australia's facilities. Boeing

Shortlist announced for Shadow 200 replacement

THE AUSTRALIAN Department of Defence has announced the four companies competing for the Australian Army's Shadow 200 Tactical Unmanned Aerial System (UAS) replacement. Project LAND 129 Phase 3 has now progressed to the tendering process, with the four down-selected companies being: Insitu Pacific, Leidos Australia, Raytheon Australia and Textron Systems Australia. The firms will be provided with a detailed request for tender, to further explore plans and conceptual integration designs.

The next phase of the project will focus on a competitive evaluation of more comprehensive tendered solutions from the four bidders, prior to progressing to government consideration in 2021. The army is looking to replace 18 RQ-7B Shadow 200 Version 1 drones acquired under Joint Project 129 Phase 2 and now operated by the 20th Regiment at Gallipoli Barracks in Enoggera, Queensland.



A Shadow 200 at Shoalwater Bay Training Area. LSIS Jake Badior/Commonwealth of Australia, Department of Defence

In Brief

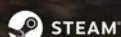
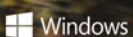
■ US approves LRASM sale for RAAF Hornets

The US State Department has authorised a possible Foreign Military Sale to Australia of up to 200 Lockheed Martin AGM-158C Long-Range Anti-Ship Missiles (LRASMs) and related equipment for an estimated cost of US\$990m (£768m). The Royal Australian Air Force (RAAF) will use the weapons to arm its F/A-18F Hornets and, according to the US Defense Security Cooperation Agency, they will "provide enhanced capabilities in defence of critical sea-lanes".

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Turkey battles

Russia and Turkey came close to war in late February after an air strike in Syria claimed the lives of 34 Turkish troops. At the same time, Russian and Turkish soldiers were patrolling together along the Syrian/Turkish border, while Ankara was also waging a separate campaign in Libya. **Alan Warnes** investigates

During the evening of February 27, the Syrian Arab Air Force claimed the largest number of Turkish Army fatalities since Ankara intervened in the conflict in August 2016. Thirty-four troops were killed by SyAAF Su-24 *Fencers* (although some reports claim they were Su-22 *Fitters*). Russian targeting information would almost certainly have been used in support of the attack. Almost immediately, Syrian government troops came under repeated Turkish attacks. Meanwhile, Russia's President Vladimir Putin and

his Turkish counterpart Recep Tayyip Erdoğan moved to avoid serious confrontation by agreeing to a ceasefire in Syria's Idlib province on March 5.

Turkish troops had pushed into Idlib – the only province not under control of the Syrian regime leader, Bashar al-Assad – in early February to try to stop a worsening humanitarian crisis. It came after weeks of air strikes on the local population by both Russian and Syrian jets. The Russian Aerospace Forces (VKS) have been working alongside the less capable SyAAF with up to 12 Su-24s, Su-25s and Su-34s plus

four Su-30SM/Su-35S *Flankers* deployed at Khmeimim air base (also known as Hmeimim) near Syria's coastal city of Jableh.

The Turkish soldiers were part of a convoy of vehicles belonging to a mechanised infantry battalion forced to stop because of ongoing air attacks ahead of them. They sought refuge in buildings in the town of Belyun and were subsequently targeted by the SyAAF. Initial reports said VKS Su-34s based at Khmeimim were also involved, although the Russian government denied this. A Russian defence ministry statement said: "The under-fire Turkish military were located among formations of terrorists fired on by Syrian troops."

A US official told reporters on February 28 that Washington was looking at ways to support Turkey, although not by committing troops. Speaking on condition of anonymity, he said: "Russia is responsible for this offensive," but acknowledged that Russia closely planned all operations with Syria. There were also claims Russia refused to open the airspace over Idlib for Turkish helicopters

Right: The Anka-S armed with the MAM-L bomb (seen here) was being used over Idlib in late February, when several examples were shot down by Syrian air defences. **Alan Warnes** **Right:** Turkey's Bayraktar TB2 drone has been used in both Syria and Libya to good effect. The air force's primary TB2 operating base is Batman, in the southeastern Anatolia region. **Alan Warnes** **Below:** Turkish E-7T AEW&C aircraft reportedly began tracking the LNA's Wing Loong II UAVs late last year, passing their positions to troops on the ground equipped with anti-drone systems. The four E-7Ts acquired under the Peace Eagle programme serve with 131 Filo at Konya. **Alan Warnes**



on two fronts



performing casualty evacuation for the wounded. Instead they were driven to a Turkish town, Reyhanlı, around 44 miles (70km) away.

Local reports claimed that, in the lead-up to the attack, troops backing Assad had killed at least 13 Turkish soldiers who were moving deeper into Idlib province. According to a Turkish government spokesperson: "The soldiers were attempting to stop the slaughter of women, children and old men in the area."

Turkish journalists reported that Turkey had fired more than 15 missiles from man-portable air defence systems (MANPADS) at Syrian and Russian aircraft earlier on February 27 and speculated that the latter could have been damaged,

leading to a swift response.

Whatever the reasons for this deadly strike on its troops, Ankara retaliated. Attacks by armed Baykar Bayraktar TB2 and Turkish Aerospace Anka drones were backed up by heavy artillery directed against Syrian Army personnel, while several air bases and military facilities were also hit.

As tensions grew, Russia dispatched the Black Sea Fleet frigates *Admiral Makarov* and *Admiral Grigorovich*, both equipped with Kalibr cruise missiles. They left Sevastopol on February 27 and headed through the Bosphorus strait for the Mediterranean where they were joined by their sister warship, *Admiral Essen*. Armed with longer-range missiles, they would be less vulnerable to Turkish air defences.

Air raids continue

Further Turkish strikes followed on February 28/29 against a wide range of Syrian and Hezbollah targets in both Idlib and Aleppo. The Shia Islamist group Hezbollah admitted on social media that a large number of its fighters had been killed in the attacks. The Turkish military struck Syrian BM-21 Grad multiple rocket launchers and other vehicles and claimed to have destroyed 55 tanks, three helicopters, 18 armoured vehicles and an assortment of other Assad regime targets. These attacks were likely supported by Anka-S unmanned aerial vehicles (UAVs) monitoring the area and relaying videos and images by satellite communication to ground stations to provide targeting co-ordinates. Video footage of subsequent strikes was released by the Turkish defence ministry and targets ►

Russian relations

Up until late February, Russia and Turkey had enjoyed good relations after Ankara signed a deal to acquire Russia's S-400 air defence system in September 2017. The Turkish government wanted it to protect Ankara and it was expected to be operational in April this year, following initial deliveries last July. Some local experts have suggested the government required an air defence system offering some independence from the rest of the military, in case of another coup attempt like that which failed in July 2016.

The US had previously refused to sell Turkey the Raytheon Patriot air defence system. The US government subsequently offered to fast track a Patriot sale to Turkey in 2019, if it cancelled the S-400 purchase. Erdoğan turned down the offer, but suggested Turkey might want to buy more Patriots to defend the rest of its airspace. The US offer expired last summer, and Turkey was expelled from the F-35 programme, which means its F-4Es are now set to continue flying until 2030. The move also saw many of its local aerospace companies – including Turkish Aerospace – lose valuable F-35 work. Meanwhile, NATO-operated Patriots continue to protect the eastern flank of Turkey's airspace.





1

appear to have included a Pantsir-S air defence system and a Buk-M1-2 medium-range surface-to-air missile (SAM) system.

Turkey's Operation Spring Shield commenced on March 1, with Turkish Air Force F-16s downing two SyAAF Su-24s with AIM-120C AMRAAMs, from inside Turkish airspace. A Syrian L-39ZO Albatros suffered a similar fate on March 3 but unlike the Su-24 aircrew, one of the pilots was killed (see *Attrition*, p86-89). F-4Es firing the Roketsan Stand-Off Missile (SOM) may also have been involved in attacking runways at Kweiris, Menagh and Neyrab air bases, although aircraft from the latter were evacuated to Hama.

Turkey's defence minister Hulusi Akar announced on March 1 that "2,200 Syrian regime troops, a drone, eight helicopters, 103 tanks, tens of howitzers and three air defence systems" had been "neutralised".

Russian S-400 air defence systems located around 31 miles

(50km) south of the Turkish border at Khmeimim air base were not attacked. If they had been struck by Turkish F-16s, it would have almost certainly provoked a strong response from Moscow.

While Turkish and Russian forces were standing off against each other in Idlib, further north they were patrolling areas of Syria together, along with the Iranians, under the tripartite Astana peace process brokered in early 2017. Russia – which controls much of northern Syria's air defences – even permitted the Turkish Air Force to operate in Syrian airspace, primarily to bomb the Kurdish People's Protection Units (YPG), but after the events of late February Russia could no longer guarantee the safety of Turkish aircraft.

A ceasefire was effectively negotiated on March 5, by which time 55 Turkish soldiers had been killed, along with hundreds of Syrian and other pro-Assad militia. Turkey and Russia agreed to carry

out joint patrols in Idlib on March 15. Under the latest deal, military activities will end in Idlib and a security corridor will be established 3.7 miles (6km) to the north and south of the key M4 highway. Turkey hopes the ceasefire will stem a month-long Russian-backed assault on the region, home to some three million people.

Operation Spring Shield is the fourth Turkish military operation in northern Syria. It follows Peace Spring, which began on October 9, to secure the Turkish border areas to the east of the Euphrates River in northern Syria and ensure the safe return of Syrian refugees. Turkey also carried out two cross-border operations west of the river – Euphrates Shield in August 2016 and Olive Branch in January 2018 – to drive out so-called Islamic State (IS) and YPG militias. The latter group is a key part of the Syrian Democratic Forces and has been allied with the US in fighting IS but is regarded by Turkey as a terrorist organisation.

Turkish drones

The use of medium-altitude long-endurance (MALE) UAVs in such contested airspace is unprecedented. While Turkish UAVs operated over Syria, manned fighters continued their operations inside Turkey. The threat of Syrian air defence systems like the S-300PM (SA-10 *Grumble*), which has a range of around 156 miles (250km), led the Turkish to drop standoff weapons and fire AMRAAMs from within NATO airspace. Meanwhile, Syrian air defence systems and aircraft did not dare fire at the aircraft due to the risk of NATO reprisals.

Sending unmanned aircraft into an area where plenty of SAM systems were present made tactical sense but not surprisingly a number of Turkish UAVs were shot down – five Anka-S and seven TB2 drones, according to Russia's *Izvestia* news agency. Anka-S serial 18-031 was downed on February 25 over southern Idlib. A photo

3



1: Turkish Air Force F-16s were in action against Syrian air defences in late February and early March. They were responsible for shooting down two Syrian Arab Air Force Su-24 'Fencers'. F-16C 07-1009 is one of Turkey's advanced Block 50+ jets. Crown Copyright 2: The Roketsan Stand-Off Missile was also used against Syrian targets. The SOM-J (nearest camera) was planned for integration on the F-35, while the standard SOM is used by the F-4E and F-16. Alan Warnes 3: An unarmed Turkish Air Force Anka UAV. The air force is currently thought to operate at least 30 Ankas, in different variants, including the latest Anka-S equipped with satellite communications for beyond-line-of-sight operations. Turkish Aerospace 4: With the Lockheed Martin F-35 no longer an option for the Turkish Air Force, the F-4E Phantom II is set to soldier on until 2030. Alan Warnes

4



released on social media on March 1 showed an Anka-S that had been shot down, with Roketsan MAM-L munitions close by.

Until the appearance of the Anka-S, Bayraktar's tactical drone was the only combat UAV built in Turkey. Having produced the prototype Tactical Block 1 (TB1) in 2005, the company developed a TB2 variant for the army. The platform has recorded more than 20,000 hours since being introduced to army service in September 2015. The first 12 were delivered in two batches – six by November 2014 and another six by June 2015 – and more have followed. Initially they were used for intelligence, surveillance and reconnaissance (ISR), but the army started testing an armed version in December 2015, followed by a first live firing in June 2016. Lütfi Bayraktar, the company's general manager, told *AFM* in May 2017: "It has been a year since we first fired weapons and there has never been any collateral damage. High-quality imaging by the L3 Wescam MX-15D easily distinguishes armed militia from civilians. And the weapon is small, so the impact area is small."

Roketsan has developed the MAM-L mini smart munition – a glide-bomb derivative of the laser-guided anti-tank L-UMTAS missile – and the Cirit 2.75in (70mm) rocket for the TB2. The drone was initially fitted with two pylons, but an additional pair of hardpoints was added in 2017. Bayraktar added: "It does reduce the duration – without weapons it can fly 24 hours and with a full weapons payload for 14 hours. But that's still a lot. The Bayraktar UAV uses its MX-15D EO/IR [electro-optical/infrared] turret to 'lase' the weapons being fired from helicopters and F-16s."



The SATCOM-capable Anka-S has supported both Turkish Air Force air surveillance and offensive operations, with its beyond line of sight (BLOS) downlinks and a Viasat VR-18C satellite antenna. The UAV is commanded through satellite and land data links, with the operations centre based in Turkey able to operate six at a time. The centre has the ability to store, distribute and back up all the data including videos/images coming from the Anka-S, which is equipped with an indigenous Aselsan Common Aperture Targeting System (CATS).

The armed Anka-S made its combat debut in Syria and in late February provided a more capable 'bomb truck' than the Bayraktar TB2, with a 440lb (200kg) payload compared with 330lb (150kg) for the TB2. The high-profile successes of the UAVs in action has of course been good marketing for the Turkish drones. Turkish Aerospace sold six Anka-S systems to Tunisia in

early March in a deal worth around US\$240m and there are ongoing discussions for armed Ankas, too. In mid-March, the Ukrainian defence ministry announced it was test-flying the TB2 in country. Ukraine's then President Petro Poroshenko and Turkish President Erdoğan signed an agreement on the purchase of 12 TB2s for the Ukrainian Army in January last year. Ukraine's Ukrspetsproject and Turkey's Baykar Makina are collaborating on the deal. Qatar has also bought the TB2 and on July 16/17 last year, a TB2 achieved a significant milestone when it flew for 27hrs 3mins during a demonstration flight in Kuwait.

Around 100 armed TB2s are thought to be operated by Turkey's Gendarmerie General Command, the General Directorate of Security and the National Intelligence Organisation (MIT). Meanwhile, a larger armed drone is on the way. The Bayraktar Akıncı completed its first test flight last December 9. It is planned to carry a payload of

almost 1.5 tons – 1,984lb (900kg) externally and 992lb (450kg) internally. According to Baykar, the Akıncı will be equipped with an electronic support measures pod, air-to-air radar, satellite communication system, synthetic aperture radar and meteorological radar – all designed and developed in Turkey. The platform will operate with various armament configurations. Officials have said the drone may be equipped with air-to-air missiles developed in Turkey and is expected to officially start serving the Turkish security forces this year.

Turkey in Libya

The latest crisis in Syria came at a time when the Turkish government was fighting a proxy war in Libya, propping up the Tripoli-based Government of National Accord (GNA), which is recognised by the United Nations as the legitimate Libyan government. Turkey is trying to stop the advances of the Libyan National Army ▶





A Turkish F-4E-2020 Terminator armed with an Israeli-made Popeye standoff missile takes off from Konya air base. Phantoms were reportedly involved in attacks on the Syrian air bases of Kweiris, Menagh and Neyrab during Operation Spring Shield. Crown Copyright

(LNA), led by General Khalifa Haftar, and supported by Egypt, Russia, Saudi Arabia and the United Arab Emirates (UAE).

Turkey signed a military co-operation deal with the GNA late last year, leading to the deployment in January of Turkish 'military trainers' and Turkish-backed Syrian National Army troops to support the GNA.

Until then, the conflict had over the past year been fought by LNA troops reinforced by Bayraktar TB2 UAVs against GNA personnel using Chinese Wing Loong II UAVs supplied by Qatar and the UAE. It was effectively a drone war.

On February 25, just two days before the 34 Turkish troops were killed in Idlib, Ankara lost two soldiers in Libya – its first confirmed casualties since the deployment began. There were reports coming out of Libya at the time that 16 Turkish soldiers had actually been killed, but this has not been confirmed by Ankara.

In a bid to exploit Turkey's focus

on Syria, General Haftar's LNA fired up to 250 Grad rockets on Tripoli during the last few days of February. They also claimed to have shot down up to ten UAVs during late February/early March, including a TB2 that had just taken off from Mitiga International Airport near Tripoli on February 26.

The first TB2s are believed to have been delivered by ship in May last year and were subsequently split between bases at Misrata and Tripoli-Mitiga, operated by Turkish personnel. The *Libyan Address Journal* reported that eight GNA pilots went to Turkey in June to learn how to operate the drones. On the LNA side, Chinese-made Wing Loong IIs are reportedly operated by personnel in the UAE using a Thales satellite system and Israeli optics. Since April last year, when Haftar started his charge on Tripoli, both the TB2 and Wing Loong II have been involved in several significant attacks.

In an audacious mission last July 25, several TB2s supporting the

GNA attacked and destroyed two Il-76TDs that were aiding General Haftar's LNA at Al Jufra air base. The transports were operated by Ukraine's Europe Air freight company and had allegedly arrived from the UAE carrying weapons.

The LNA took revenge on August 6 when at least one Wing Loong II fired several 110lb (50kg) Blue Arrow-7 (BA-7) munitions and destroyed another Ukrainian-registered Il-76 operated by Alfa Air, parked at Misrata air base. The Russian-made freighter had arrived from Ankara at around 1030hrs, with ammunition and UAVs, when it was hit. The LNA attacked Misrata twice on August 15 and 16, claiming there was a large Turkish presence there and that it was the centre of GNA drone operations.

While the Chinese Wing Loong II's original weapon of choice had been the Blue Arrow-7, the China National Aero-Technology Import & Export Corporation (CATIC) is now marketing the smaller 35lb (16kg) TL-2 bomb, loaded on to the two inner weapons pylons that can carry three munitions each. A CATIC spokesman told AFM in late 2018: "You don't always need such big weapons as the 50kg BA-7. With TL-2s on board, the Wing Loong II can fly more than 20 hours."

In a significant milestone in the drone war, a Wing Loong II is believed to have been downed by an anti-UAV system last August 4. While flying an armed mission from Misrata it suddenly plummeted and crashed into the desert. Turkish Air

Force Boeing E-7T airborne early warning and control (AEW&C) aircraft with signals intelligence (SIGINT) capabilities are thought to have been operating off the Libyan coast at the time, tracking the Wing Loong IIs and sending data to Turkish anti-drone systems to jam the UAV's line of sight control. It's unclear which system was used, although Aselsan, one of Turkey's premier defence companies, offers the cost-effective HASAVAR, a backpack-mounted, handheld, anti-drone jammer. More recently, two Wing Loong IIs being controlled by a beyond line of sight (satellite) system were downed by Turkish MIM-23 HAWK air defence systems, which apparently led to the Chinese drone being withdrawn from LNA service.

Last year Haftar attempted to purchase the Royal Jordanian Air Force's CH-4B armed drones, prematurely retired in 2018 after only a couple of years of service. However, the five surviving drones were still in Jordan earlier this year. The RJAf's Brigadier General Pilot Adham Belal Asendar, commander of operations and training, told AFM in October 2018 that the CH-4Bs were being retired due to "issues" but wouldn't go into any more detail.

Although 12 have been shot down, MALE UAVs have appeared to work well over Syria. But they are not always the answer. If Libya's GNA has found ways to bring down both line of sight and beyond line of sight UAVs, then there still remains a role for manned fighters and bombers. **AFM**



Above: A Syrian Arab Air Force Su-24 of the type apparently involved in the February 27 air strike that killed 34 Turkish troops. Tom Cooper Collection Below: Two F-16Cs from the Turkish Air Force's 152 Filo (Block 50 94-0091, nearest camera) and 143 Filo (Block 30, 87-0015) on the runway threshold. The latter unit was one of those disbanded in the wake of the failed coup in July 2016. Derek Bower



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Belgian F-16s on BAP

On May 1, a detachment from the Belgian Air Component will depart Šiauliai air base in Lithuania after a period of eight months, during which four F-16s have been on constant guard as part of NATO's Baltic Air Policing mission. **Benoît Denet** spoke to the pilots involved.

Above: Russian Aerospace Forces Tu-160 '04 Red'/RF-94112 - named 'Ivan Yarygin' - is shepherded through international airspace over the Baltic by a Belgian F-16AM last September. Belgian F-16 pilots have approached to around ten metres of these bombers. Belgian Air Component **Below:** All four fully armed Belgian F-16AMs stationed at Šiauliai air base in Lithuania formate for the camera during a BAP mission. **Inset:** A 349 Squadron patch prepared for the latest BAP mission. Four pilots are provided by the four Belgian F-16 squadrons. Aircrew are posted to Lithuania for a period of two to three weeks. **Bottom:** Scramble! Pilots for the two QRA jets race to the aircraft awaiting them in Šiauliai's shelters. As lead BAP nation, Belgium keeps two aircraft on 15 minutes' readiness around the clock. All photos Benoît Denet unless stated



and a security officer. Four pilots are provided by the four Belgian F-16 squadrons and are posted to Lithuania for a deployment period of two to three weeks. On alternate days, two pilots and a small team made up of two crew chiefs, an intelligence officer, a meteorologist and a fireman, are on 24-hour standby in a building close to the four aircraft hangars.

The maintenance detachment is made up of two commissioned officers and 34 non-commissioned officers, including airframe and engine specialists plus crew chiefs. A team of armourers is also essential as all weapons must be removed before maintenance work is started and refitted afterwards. The operational group consists of pilots, intelligence officers, meteorologists and a team mission planner. Finally, the support group incorporates administrators, medics and military police staff. An IT communications team and a logistics team complete the detachment. All staff who are not on standby sleep at the local hotel.

Ready to scramble

Šiauliai is still the hub or 'leader' base and hosts the lead nation handling BAP operations, in this case Belgium. The lead nation is required always to have two aircraft ready to scramble in 15 minutes, 24 hours a day for the duration of its mandate. Along with aircraft at Ämari air base in Estonia, the BAP group has a total of four fighters on 15-minute alert. In case of technical problems, four other aircraft must be on 30-minute standby.

Major G continued: "Once or twice a day, ▶

The Baltic Air Policing (BAP) mission, to ensure the integrity of NATO airspace in the region, began in 2004 at the request of the alliance's three then-newly joined countries - Estonia, Latvia and Lithuania. Belgium was among the first to send fighters on BAP duty in 2004 and, along with Germany, has been one of the most regular participants.

A defensive mission, BAP follows a conventional NATO chain of command, and the Belgian F-16s are placed under the direct command of the Supreme Allied Commander Europe (SACEUR), the office of which in turn oversees the Combined Air Operations Centre (CAOC) at Uedem in Germany, responsible for operations in the Baltic countries. When NATO initiates a tactical action, the CAOC sends an interception order, which is relayed by the Control and Reporting Centre (CRC) at Karmėlava in Lithuania.

Major G (full name withheld on request), a former BAP detachment commander (DetCo)

with the Belgian Air Component, explained a typical scramble: "There are several reasons to launch a scramble mission. These are an aircraft in distress; an aircraft deviating from the rules and approaching NATO airspace; an aircraft without a flight plan; and an aircraft without radio contact. NATO states that there will be a proportionate air-policing response to ensure the safety of the airspace and these users. Before 2004, Russian aircraft crossed the airspace of the Baltic countries; now they fly regularly in the international airspace between Finland and the Baltic countries without a flight plan. This explains our intervention. We need to identify the aircraft, and to do this we need to get as close as possible to what is allowed for flight safety. Identification is made by identifying various elements - the type of aircraft, its behaviour, registration, possible armament and what it could have under the wings - sensors etc - and if the electromagnetic environment is hostile or not. I have flown very close to Tu-160s at around ten metres [33ft]. We are much more careful with the Su-27s."

The latest Belgian detachment comprises around 60 people divided into three groups: the operational group commanded by the director of operations (DO); a maintenance group led by the director of maintenance operations (DMO); and a support group commanded by the director of support operations (DSO). The DetCo, who commands the detachment for a period of two months, is accompanied by an executive officer





Above: Single-seat F-16AM FA-56. The 'bump' under the engine intake is related to the Carapace/KRP system fitted to Belgian F-16s. This electronic warfare system is a useful aid for identifying and locating intercepted aircraft. Fuel tanks of 370 US gal capacity are routinely carried under hardpoints Nos 4 and 6.

two or three F-16s would fly. For example, in September 2019, we flew 160 hours, including eight real interceptions, for the detachment. I organised regular training missions. This is important; to avoid just being in a waiting room, it is better to fly the aircraft and keep the personnel busy. In four months, the detachment will have flown 290 flights and about 500 flight hours. The number of scramble flights fluctuates a lot with the weather and the various Russian exercises in the region. Every 300 flight hours the F-16s must return for a maintenance phase. With the proximity of Belgium, this is quite simple."

For these quick reaction alert (QRA) missions, Belgian F-16s are equipped with two AIM-9M Sidewinder missiles attached to underwing hardpoints Nos 2 and 8, and two wingtip-mounted AIM-120B AMRAAM missiles (hardpoints Nos 1 and 9) for better aerodynamics. The 20mm cannon is loaded with 500 rounds including a number of tracer

QRA launches in Baltic Air Policing

Year	Alert launches
2019	200
2018	145
2017	135
2016	130
2015	185

bullets for improved visibility. Under hardpoints Nos 4 and 6 are mounted fuel tanks of 370 US gal (1,400 lit) capacity. Since 2019, the two F-16s on 15-minute alert have also been equipped with a Sniper pod, offering day and night vision over a range of six miles (10km), invaluable for interceptions at night in addition to night-vision goggles (NVGs), and also allowing improved integration with ground forces during close air support (CAS) mission training. In this configuration the F-16 has an endurance of 2hrs 20mins for a 'normal' flight. According

to mission profile, altitude and whether a supersonic flight profile is required, this can reduce to 1hr 15mins. In QRA configuration, the aircraft is in the hands of the pilot for 24 hours, and he is able to organise his aircraft as he sees fit, installing various equipment such as NVGs and recording systems in advance.

Data link advantage

The Link 16 data link system also plays an important role in the BAP mission. It enables an image to be presented in the cockpit from the CRC in Karmėlava or elsewhere, including the radar picture of an AWACS or other NATO aircraft. It is connected to the command network, which can provide the two CAOCs with a radar image of everything that is flying, all the sensors, and any tactical actions that may be launched. The system allocates a coloured symbol to each of the various tracked aircraft, enabling the F-16 pilot to monitor possible threats continuously and avoid using one of his own sensors which may lead to being tracked himself.

Another valuable feature for the F-16 pilot is the Joint Helmet Mounted Cueing System (JHMCS) in which all returns at a range of up to 400nm may be displayed. All information from the JHMCS and the head-up display (HUD) is captured by the Digital Video Recorder (DVR) and may be used as evidence if necessary.

Major G described a typical mission from Šiauliai: "During my 24-hour alert period, I leave everything in the aircraft. I wear a G-suit all day. At night I prefer to spend three minutes getting dressed so that I can wake up. In winter I also wear a special suit, in case of ejection into cold water, which is quite uncomfortable. From the moment the warning bell sounds, the fastest pilots are ready to take off in six minutes 30 seconds, the slowest in 12 minutes. The key is not to be too stressed, because it is at this precise moment that you risk incorrectly launching the INS [inertial navigation system] or something else and can easily lose four minutes to restart everything. After take-off, it will take me 15 to 20 minutes to reach an



Above: An official Belgian MoD organogram showing the national contributions to the BAP mission at the lead base of Šiauliai and the augmenting bases at Ämari in Estonia and Malbork in Poland. Belgian MoD

unidentified aircraft at 30,000 feet [9,144m] in the international zone in the Baltic Sea at 100 nautical miles [185km]. It depends on whether it comes from Kaliningrad or elsewhere.

"The leader will position himself to the left of the intercepted aircraft and [the interceptor's] wingman will stay behind. The aim is to illustrate to NATO command what sort of threat the intruder represents, for which all our equipment and sensors are extremely useful. During an interception of two Tu-160 *Blackjacks* flying in formation with two Su-27 *Flankers*, I was aided greatly by the Carapace/KRP system fitted to Belgian F-16s. This system, developed by Thales, analyses the electromagnetic environment and establishes the type of radar signal of the unidentified aircraft. It identifies the platform that is observing me by locating it. In the case of the Russian formation, after its turn over the Baltic, as we were approaching it at 15 nautical miles [28km], the two *Flankers* turned violently towards us. I was busy on my screens with the Link 16, not on the radar page. It was Carapace/ KRP that alerted me. Finally, the *Flankers* went down to Kaliningrad and the *Blackjack* continued on its way. We have intercepted Su-24s, Su-33s, Su-35s, Tu-95s, Tu-22s, Tu-160s and [An-12] *Cubs* among others." **AFM**



Standing fully armed in one of the shelters at Šiauliai, a Belgian Air Component F-16AM awaits its next QRA scramble. Note the Sniper pod carried on the intake – a useful tool for both day and night interceptions as well as close air support training with ground troops.

NATO Air Policing

NATO Air Policing is a peacetime collective defence mission at the very heart of the alliance's founding treaty. It ensures the integrity of NATO allies' airspace and protects alliance nations by maintaining continuous air policing within Supreme Allied Commander Europe's (SACEUR's) area of responsibility. On SACEUR's behalf, Allied Air Command at Ramstein Air Base in Germany oversees the peacetime mission of NATO Air Policing.

NATO's Combined Air Operations Centres (CAOC) at Uedem in Germany and Torrejón in Spain manage the conduct of these air policing efforts, initiating and monitoring all launches of NATO-assigned QRA(I) (quick reaction alert – interception) aircraft and reporting to Allied Air Command HQ at Ramstein, where all intercept information is registered by the Air Policing and Reporting section.

NATO-allied radars pick 'tracks of interest' from the 30,000 daily air movements within European airspace. If an aircraft is not 'squawking' (sending a transponder code) or is failing to maintain radio

contact with civilian air traffic control, or has not filed a flight plan, its track is reported to one of the two NATO CAOCs, which then decides whether or not to launch a QRA aircraft from one of the 35 NATO-allied air bases on 24/7 standby for such missions. Once launched, the QRA aircraft is controlled by one of the 30 Control and Reporting Centres (CRCs) and vectored to the unidentified aircraft.

On January 14 this year, a training mission for northern Europe was organised from Brussels using a Belgian Air Component Airbus A321 to play the role of a potential 'hostile', to be intercepted with a series of QRAs. Partner nations Finland and Sweden, which co-operate in the Baltic region despite not participating in BAP operations, were also included in this exercise flight. Preserving the integrity of NATO airspace is a collective task. For NATO nations that do not have sufficiently advanced air capabilities – Albania, Estonia, Iceland, Luxembourg, Montenegro, Latvia, Lithuania and Slovenia – agreements are in place to ensure airspace security within SACEUR's area of responsibility.

Since January 2017 a BENELUX Air Policing arrangement, for the airspace protection of Belgium, the Netherlands and Luxembourg, means that the Belgian Air Component and the Royal Netherlands Air Force take turns to ensure a QRA capability is available 24 hours a day, seven days a week, 365 days a year, under NATO control. The NATO peacetime mission in Iceland is unique to Iceland. NATO allies, in combination with the Icelandic authorities, have agreed that the appropriate response is to maintain a periodic presence of NATO fighters based at Keflavik to keep Icelandic airspace safe and secure. In Slovenia, the NATO mission is shared by the Hungarian and Italian Air Forces, while in Albania the Italian and Hellenic Air Forces provide this capability. In addition, Italy and Greece will henceforth extend their important contribution to NATO Air Policing to cover the airspace over Montenegro. In such cases, the fighters remain stationed at their home bases, but the CAOC at Torrejón scrambles them to respond to air incidents inside the allies' airspace.



A two-ship of Royal Danish Air Force F-16AMs – E-189 is nearest the camera – were among the alliance fighters that took part in a training mission over northern Europe on January 14. They were photographed from the 'hostile': a Belgian Air Component A321.

QRA launches NATO-wide

Year	COMMLOSS incidents*	Resulting in alert launches	Overall alert launches	Alert launches vs Russian air arms
2019	489	80	430	290
2018	590	77	420	290
2017	816	82	430	250
2016	504	76	870	780
2015	470	79	480	410
2014	307	54	480	420

*COMMLOSS = communications loss

The Kypriakí Polemikí Aeroporia (Cypriot Air Force) is the armed air wing of the Ethnikí Frouará (Cypriot National Guard) and is based in modern facilities on the north side of Paphos International Airport on the south coast of Cyprus, 6.2 miles (10km) southeast of the city of Paphos. The military portion of the facility is named after Andreas Papandreou, the former Greek prime minister who was a strong advocate of the creation of this air base back in the 1990s.

The commanding unit of the air force is 55 Sminarchia Mahis (55 Combat Group) with 20 helicopters organised in two squadrons: 450 Mira Elikopteron (ME/P), which flies the attack helicopters, and 460 Mira Erevnas Diasosis (MED) – tasked with search and rescue (SAR).

Each squadron has its own building and

ramp. Two hangars are provided for 450 ME/P while 460 MED has just one. The base is also equipped with half-a-dozen hardened aircraft shelters. These are sometimes used during exercises by visiting fighters and occasionally by other jets that divert there after an emergency.

450 Mira Elikopteron

This squadron was formed at Paphos on October 15, 2001. It is organised in two Sminos (platoons): 1 Sminos, named 'Scorpion', operating the SA342L1 Gazelle, and 2 Sminos, named 'Panther', responsible for the Mi-35Ps. The main task of both these platoons is anti-tank warfare. The squadron badge has 12 stars (representing the original 12 Mi-35Ps) over a black panther, plus the blue and white roundel.

1 Sminos 'Scorpion'

In July 2010, four Gazelles (serials 352 to 355) were transferred to 450 ME/P from 449 MEE, a helicopter squadron that had been based at Lakatamia air base in Nicosia until the closure of that facility.

The SA342L1 is the military export version of the SA342J. A remarkable feature of the helicopter is the ability to stop the main rotor during a 'hot' crew change – a necessity of the relatively low position of rotor blades.

Primarily used in the anti-armour role, the Cypriot Gazelles can be armed with up to four HOT 3 missiles. With a range of just over 2.5 miles (4km), this weapon is capable of penetrating 51in (1,300mm) of steel. The Gazelle is also

utilised for airborne observation and currency training within 450 ME/P. When teamed up with the Mi-35P, the Gazelle typically flies ahead in the observation role. The French-designed helicopter is better suited to this role since it has a lower visual and noise signature than the Mi-35P.

2 Sminos 'Panther'

The main mission of this unit is also anti-tank, but it can undertake a range of offensive and defensive missions as well as supporting special operations. The platoon is equipped with the Mi-35P *Hind-F* – the export version of the Mi-24P *Hind-F* in which the P stands for *Pushka*, or cannon. Unlike the Mi-24P, the Mi-35P has fixed undercarriage, a feature also found on the current production Mi-35M. Furthermore, the chaff and flare dispenser rails are mounted on both sides of the rear fuselage, ahead of the tail



boom. On late production *Hinds*, these dispensers are normally covered by an aerodynamic fairing. Later still in the production run, this fairing was deleted, and the rails simply mounted on the fuselage.

Production run of the P-version for export started in 1989 with 12 examples for East Germany (these were designated Mi-24P). From 1995, production continued as the Mi-35P. The Cypriot *Hinds* were built in 2001, but there is some dispute as to whether they are really new-build examples. Aircraft and helicopter production in the Soviet Union and later Russia almost fell to nil after the Cold War, and unfinished airframes were put in storage. While their fixed undercarriage suggests they were new builds, the Cypriot *Hinds* may also include previously manufactured components.

Deliveries to Cyprus began in ►



Above: Mi-35P serial 817 of 450 ME/P's 2 Sminos 'Panther' takes off from Andreas Papandreou last October 3. All 11 'Hinds' were overhauled by the 419 ARZ at Saint Petersburg during 2014 and were repainted in this desert camouflage scheme. All photos CRM/Map/Marinus Dirk Tabak and Jack Bosma unless stated **Inset:** A maintainer's patch from 450 ME/P proudly declares: 'We fix Russian, we fix anything'. James Lawrence **Below:** Serial 353 (c/n 2196) is one of the air arm's SA342L1 Gazelles, which are operated by 1 Sminos 'Scorpion' of 450 ME/P. The air force's Gazelles were transferred to the unit in 2010 when their former squadron – based in Nicosia, the capital of Cyprus – was disbanded. Cypriot Air Force **Left:** A patch presented to 'Scorpion' pilots who accumulate 1,000 hours on the Gazelle and Bell 206L-3. James Lawrence

Cypriot Air Force

Spearheaded by two squadrons of attack helicopters and one specialist search and rescue unit, the Cypriot Air Force is one of Europe's youngest – and smallest – air arms. **Marinus Dirk Tabak** and **Jack Bosma** visited Andreas Papandreou air base at Paphos International Airport to find out more.

Right: HOT shot! For anti-tank missions, the Gazelle carries up to four HOT 3 missiles, with a range of just over 2.5 miles. Cypriot Air Force **Below:** Now withdrawn and in open-air storage at Paphos, this is the sole-surviving Cypriot Air Force PC-9/B, serial 901 (c/n 174) previously operated by 460 MED.



August 2001, with initial conversion for both flight crew and ground personnel being undertaken in Russia at the Torzhok flight training centre northeast of Moscow.

The serials of the 12 aircraft as delivered were 811 to 822, although the last of these crashed on July 5, 2006, killing the Russian instructor and Cypriot student on board; the cause of the accident

is unknown. The *Hinds* have been periodically sent back to Russia for major overhaul and modifications at the 419 Aviatsonnyy Remontnyy Zavod (ARZ, Aircraft Repair Plant) at Saint Petersburg-Pulkovo. Helicopters rotating through Russia from late 2014 also had their original dark grey colour scheme replaced with the Cypriot Air Force's standard desert-type

camouflage, which is extremely effective over the local terrain.

The *Hind* is well respected by its crew on account of its high speed, impressive weapons arsenal and comprehensive protection suite, including radar warning receiver, heat shields, flare dispensers and armour protection; its rotor blades are able to withstand impacts by 12.7mm calibre rounds. The primary drawback is its analogue-era avionics.

The main weapon is the fixed twin-barrel 30mm calibre GSh-30-2K cannon mounted on the side of the starboard forward fuselage. The gun has a range of 1.2 miles (2km), while the aircraft has an ammunition capacity of 250 rounds. In addition, a further four 23mm calibre cannon can be carried in pairs under the type's stub wings, transforming it into a formidable six-barrel gunship. In contrast to the rotating gun

turret on other gunships – like the earlier Mi-24V – the entire Mi-35P has to be pointed towards the direction of the target.

On its stub wings, the Mi-35P can carry up to 16 9M120 Ataka (AT-9 *Spiral-2*) supersonic anti-tank missiles capable of penetrating steel armour when launched over 3.5 miles (5.8km) from the target. Other options include four pods each containing 20 unguided S-8KOM 80mm (3.15in) calibre rockets, with a range of 2.2 miles (3.5km), for use against light armoured vehicles and personnel. Depending on the mission, a mixed load of 40 S-8KOM rockets and eight 9M120s can also be utilised; as standard, the helicopters fly with two rocket pods and four launch rails.

With a range of 1.9 miles (3km), a larger warhead and fragmentation radius of around 1,969ft (600m), the unguided S-24B 240mm



Right: Bell 206L-3 serial 111 (c/n 51219) of 460 MED's Sminios 'Paris'. Four of the five examples that entered service from 1987 remain in use; an attrition loss occurred on July 10, 2002, resulting in five fatalities.





Above: A 'Hind' pilot prepares for a mission. The presence of the Mi-35P in Cyprus was initially kept secret until 2002 when the type appeared in a flypast during a general's funeral. The squadron became fully operational the same year. Dirk Jan de Ridder and Menso van Westrhenen **Below:** A pair of Cypriot Air Force Gazelles on the prowl, demonstrating the effectiveness of the three-tone desert camouflage when operating over the island. Cypriot Air Force

Colour scheme

The standard Cypriot Air Force scheme is a three-tone desert camouflage consisting of light sand, dark sand and olive green, with a blue and white Greek-style roundel on the boom and a low-visibility Cypriot flag on the fin. Until 2014-15, the Mi-35Ps were painted dark grey overall for night operations. The focus then switched to include day operations and when the helicopters went to Russia for major overhaul they were painted in the standard camouflage.

The AW139s were originally in sand and light green colours with broad diagonal orange bands. During overhaul in Belgium they were painted grey with orange bands, plus 'Cyprus Air Force' titles on the tail boom and 'SQN 460' on the engine nacelle.




(9.45in) calibre weapon is the most potent rocket available. Up to four can be carried in theory, although Cypriot *Hinds* are limited to carrying two at a time.

Usually, the Mi-35P is operated by a crew of three – pilot, co-pilot and technician. The *Hind* can also carry up to eight armed troops for support of special operations and combat search and rescue (CSAR) missions.

460 Mira Erevnas Diasosis

A dedicated SAR squadron, 460 MED has three platoons and was formed on May 25, 2010, at that time equipped with the Bell 206L-3 TexasRanger, Pilatus PC-9/B and Britten-Norman BN-2B-21 Maritime Defender. It absorbed the equipment and personnel of the disbanded 449 MEE which had been based at Lakatamia, Nicosia. The PC-9/B was removed from service around 2016 and the single BN-2B has been grounded since 2017, but not withdrawn. Both are now in storage in a shelter at Paphos. Today, the three platoons of 460 MED are equipped with the Bell 206L-3, AW139 and the Defender.

Colonel Marios Florides, commander of the 55 Sminarchia Mahis, explained to *AFM* that there were plans to refurbish the sole surviving PC-9, but this has become increasingly difficult through the years, since many parts are now time-expired. A second PC-9 was lost on September 10, 2005 in a crash near Kolossi that claimed the lives of both crew members.

The squadron badge of 460 MED depicts the mythological god Triton, symbolising the unit's connection to the sea and the AW139's 'Triton' callsign. 

Kypriakí Polemikí Aeroporiá

Right: SA342L1 serial 355 (c/n 2199) lifts off from its Paphos base. A total of six Gazelles was purchased in 1987 and the aircraft were delivered from the following year. Four remain in use today.



Cypriot Air Force order of battle

Unit	Location
Cypriot Air Force HQ	Nicosia
450 Mira Elikopteron (ME/P)	
Paphos/Andreas Papandreou	
1 Sminos 'Scorpion'	SA342L1 Gazelle
2 Sminos 'Panther'	Mi-35P
460 Mira Erevnas Diasosis (MED)	
Paphos/Andreas Papandreou	
1 Sminos	BN-2B-21 Maritime Defender*
Sminos 'Paris'	Bell 206L-3 Texas Ranger
Sminos 'Triton'	AW139

* Maritime Defender has been grounded since 2017, but not withdrawn.



450 Mira Elikopteron (ME/P)



1 Sminos 'Scorpion'



2 Sminos 'Panther'



460 Mira Erevnas Diasosis (MED)



460 MED/1 Sminos



Sminos 'Paris'



Sminos 'Triton' James Lawrence

Sminos 'Paris'

Current equipment of this platoon comprises two Bell 206L-3s (serials 110 and 111). Bell 206L-3 serial 110 was previously used in the SAR role, equipped with a winch and longer skids incorporating inflatable flotation bags for overwater operations. Once it was replaced by the AW139 in this role, the winch and the flotation gear were removed.

The TexasRangers are flown by a crew of two. Fitted out with a passenger/VIP cabin, the type can carry five passengers – three facing forward, two facing to the rear. Other tasks for the Bell type include liaison, as well as crew currency and training.

A third Bell 206L-3, serial 112, was written off in an accident on July 10, 2002, while observing a command-and-control exercise at night. All five on board were killed – the pilot, co-pilot, commander of the national guard, his adjutant and the commander of the air force. The cause was never established, although eyewitness reports suggest the helicopter was already on fire in the air.

Sminos 'Triton'

The AgustaWestland (now Leonardo) AW139 was selected when a need emerged for a modern and better-equipped SAR helicopter to replace two UH-1Hs loaned from Greece and grounded under US pressure from 2003, and the Bell 206L-3s. Three AW139s (serials 701 to 703) were ordered in December 2008 and the first two were handed over in December 2010 and February 2011, followed by the third in July 2011.

Although mainly used for SAR duties, other tasks include VIP transport, paratrooper training, aerial photography and firefighting using an underslung bucket. When required, the squadron also assists the police. Many training missions are flown to and from NATO and commercial ships, conducting deck landings and winch training operations.

In addition to standard SAR modifications, the new helicopters are equipped with a four-axis autopilot with SAR modes, radar and forward-looking infrared (FLIR) to enable both day and

night operations. Standard crew for SAR missions consists of two pilots, a rescue swimmer and a winch operator.

The AW139 receives an annual 600-flight-hour overhaul at Paphos. Every four years they go to Liège, Belgium, for a major overhaul with Agusta Aerospace Services. This involves a long flight via Rhodes, Kalamata, Corfu, Naples, Bastia, Lyon and then Liège.

Initial SAR training was provided by FB Heliservices (FBH), a joint venture formed by Cobham Aviation Services, FR Aviation Group and Bristow Helicopters at Bournemouth International Airport in the UK. With no flight simulators at Paphos, Cypriot AW139 crew go annually to Italy to train on a simulator there.

The AW139 is on round-the-clock SAR alert and, by October last year, 22 rescue missions had been flown, together with dozens of other flights including firefighting plus search and/or surveillance missions. Most of the latter have involved tracking abandoned ships, normally connected



Above: Wearing its new, toned-down scheme, this is AW139 serial 702 (c/n 31332) flown by 460 MED's Sminos 'Triton'. **Right:** One of the Cypriot Air Force's Texas Rangers (military versions of the LongRanger) patrols the country's rugged coastline.



Left: An AW139 flight crew in front of their helicopter. Standard crew for SAR missions consists of two pilots, a rescue swimmer and a winch operator. **Below:** BN-2B-21 Maritime Defender 5B-ICV (c/n 2106) of 460 MED at Andreas Papandreou last October 4. This single example entered service in 1985.



with migration and people-smuggling in the Mediterranean.

Rescue efforts within the Cyprus Search and Rescue Region are integrated by the Joint Rescue Coordination Centre (JRCC) in Larnaca.

The Cypriot Police Aviation Unit (CPAU) at Larnaca Airport conducts its work simultaneously with the Cypriot Air Force's SAR fleet. It operates two AW139s that were delivered in November 2010, joining a pair of AB412 helicopters already in use. The CPAU was established in June 2008, having previously operated as the Cyprus Police Air Wing from 1990.

Pilot training

Cypriot Air Force aviators start out with four years at the Hellenic Air Force Academy, where they complete the full Greek pilot training syllabus. Five or six pilots are trained each year. Initial training is at Tatoi air base, with 20 hours on the P2002JF Sierra, which recently replaced the T-41D Mescalero (see *Tatoi Tecnews*, July 2019, p82-85). Then they move to Kalamata for

115 hours on the T-6A Texan II, and finally 100 hours on the T-2C/E Buckeye. On their return they are posted to either 450 ME/P or 460 MED, depending on individual unit requirements and personnel capabilities. In Cyprus they continue their training on either the SA342L1 Gazelle (450 ME/P) or the Bell 206L-3 (460 MED) and after a minimum of 60 hours they continue on to the Mi-35P or AW139, respectively. Those posted to the AW139 initially serve as co-pilot, becoming a captain after 150 hours.

Instructor pilots for the Mi-35P were trained in Russia, and those for the AW139 in Italy. The Mi-35P and Gazelle co-pilots are also responsible for operating the weapons.

In total, 55 Sminarchia Mahis has 60 pilots. Operational service lasts a minimum of ten years, but a pilot can leave earlier on payment of a fee. Some pilots choose to live in Nicosia, a one-and-a-half-hour drive from Paphos. At Paphos they often fly two missions daily, one in the morning and one in the evening. During the

summer, there are many hot and humid days during which training flights are suspended. However, operational crews are ready to respond instantly to a real incident.

'Hot' crew changes are standard following the first mission of the day. The helicopter returns to the platform and the crew is swapped with the engines running. Mostly daily flying takes place between 0800hrs and 1400hrs, while night flying takes place a few evenings in the week.

Prognosis

In recent years, the Cypriot Air Force has been affected by a lack of spares, especially for the *Hind*. The situation became critical during autumn 2018 when the accounts of Rosoboronexport, Russia's defence export agency, were apparently temporarily frozen by Cyprus, in the wake of American and EU sanctions against Moscow.

The Mi-35Ps are a few years away from a scheduled main overhaul, but with weapon

embargoes against Cyprus recently lifted, thoughts have turned to replacing the *Hind* and Gazelle with a new helicopter gunship. It remains to be seen if sufficient funds become available for new attack helicopters.

However, with the introduction of the AW139, Cyprus has acquired a state-of-the-art SAR helicopter. The Cypriot Air Force remains well trained and a force to be reckoned with, despite its modest size. **AFM**

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Typhoon targets the Future

Eurofighter and its industry partners are making significant moves on future capability development.

Jamie Hunter and **Jon Lake** examine what lies ahead for the Typhoon.

Eurofighter is currently conducting a study phase for the Long-Term Evolution (LTE) of the aircraft. All photos Eurofighter unless otherwise stated



The Eurofighter Typhoon has come a long way in recent years when it comes to silencing critics over long-term credibility concerns. A raft of capability updates, such as the integration of the MBDA Meteor beyond-visual-range air-to-air missile (BVRAAM), took years to progress through development test, contract signature and entry into service. However, across the partner nations involved in the European fighter, the acronyms, sub-variants and buzz-phrases have steadily become a reality, helped by increased flexibility in the process that allows the core partners to progress at their required pace and to best suit differing agendas. The umbrella partnership still endures and those that are involved in Eurofighter still enjoy the economy of scale and a coherent development roadmap. Across the operators, from the so-called Phase 2 Enhancement (P2E) through to the UK's Project Centurion, the Typhoon is finally equipped and upgraded in a manner that has been promised for years.

While the original partner nation orders have now been satisfied, export successes in Qatar and Kuwait will keep the production lines open until 2024. However, there have been disappointments in European fighter competitions when the Typhoon lost to the Lockheed Martin F-35A in Belgium and Denmark. The jets for the new Middle Eastern customers looked like being the last for Eurofighter.

Few could have predicted that Germany would emerge as the next great hope for the Eurofighter and indeed a

launchpad for a whole new generation of the aircraft. The Luftwaffe has a requirement to replace its last remaining Panavia Tornados by 2030, coupled with an emerging desire to replace its original Tranche 1 aircraft. This has now evolved into the biggest single new requirement for the European fighter – and one that is seen as being critical to the future of European defence manufacturing. In addition, Spain could also opt for more Typhoons to enable the replacement of its EF-18 Hornets. ▀

“If Europe wants a strong defence and a strong industry to deliver it, then Eurofighter is the best choice.” Eurofighter CEO Herman Claesen



The Luftwaffe is looking to replace its initial Tranche 1 Eurofighters as well as its Tornado fleet.
Eurofighter/Geoffrey H Lee



Meeting future needs

Luftwaffe commander Generalleutnant Karl Müllner publicly endorsed the F-35 when he said that it was the favourite of the Luftwaffe to replace the Tornado. The statement secured early retirement for Müllner and an eventual announcement from the Bundeswehr in January 2019 that the F-35 had been ruled out of the competition to supply 90 new aircraft as a Tornado replacement. The case for Eurofighter was growing, especially with the potential for an all-new standard of aircraft to provide a common solution for replacing the Luftwaffe's early Tranche 1 aircraft under Project Quadriga and the Tornados through a potential slew of orders from the German military.

In May 2019, Eurofighter GmbH, Eurojet Turbo GmbH and NETMA (NATO Eurofighter and Tornado Management Agency), signed contracts worth a total of €53.7m to support the Long-Term Evolution (LTE) of the Eurofighter. The study contracts, which look at the capability development of the aircraft and the potent EJ200 engines, span 19 months for the

aircraft and nine months for the engine. Herman Claesen, CEO of Eurofighter, said in 2019:

"These contracts represent a significant step in shaping the future of Eurofighter and will ensure it continues to be one of the most important assets in the future operating environment."

The LTE study is designed to underpin the future of Eurofighter by identifying a suite of technology enhancements for the weapons system infrastructure and the engines that will ensure the aircraft remains operationally effective and can continue to spearhead air forces for the decades to come. The technology areas being explored include mission systems architecture, building on the existing electronic warfare systems by increasing the use of digital data both on-board (via advanced multi-spectral sensors) and off-board (via high-performance tactical data links), while remaining resilient to new and emerging threats, including cyber. The Praetorian Defensive Aids Sub System (DASS) looks at future requirements out to 2050, enabling Typhoon to respond faster, more easily and more affordably to new

requirements to counter threats as they arise.

A Human-Machine Interface (HMI) element involves a major update of cockpit displays and controls, which will enable more demanding missions while ensuring full interoperability with allied assets in the air and over land and sea. In addition, the use of new adaptive power and cooling techniques and the agile integration of advanced weapons is intended to lead to flexible store configurations. In terms of the EJ200 engine, the focus is on thrust growth, range and persistence with increased parts life and survivability as well as control system enhancements.

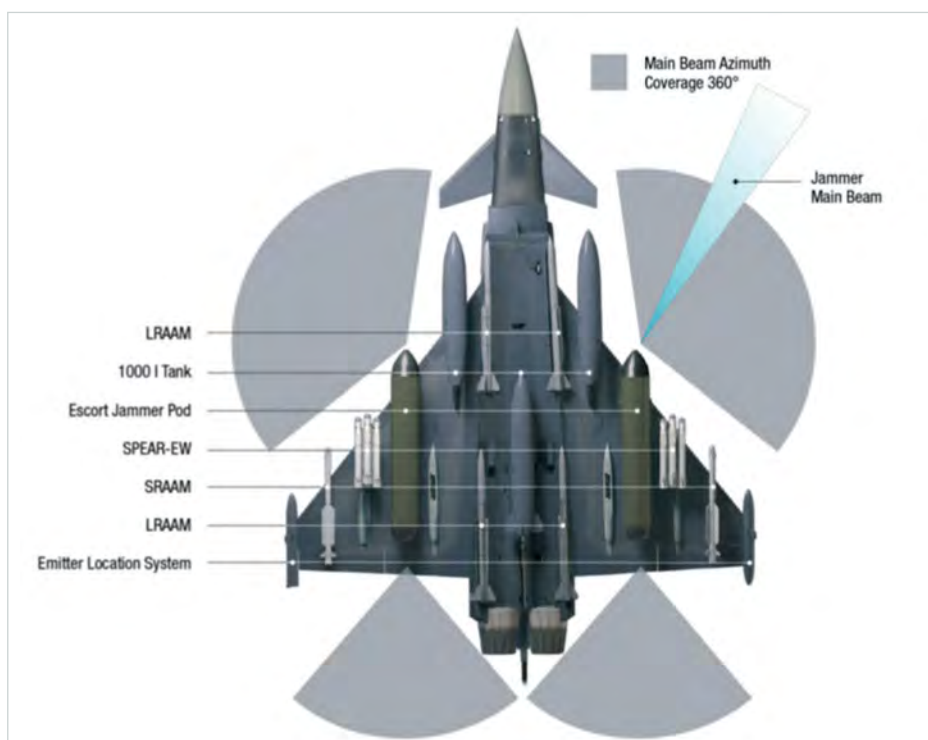
Central to many of these future ambitions is a long-running plan to add a new Aerodynamic Modification Kit (AMK) to the aircraft. Eurofighter's Head of Strategic Marketing and former fighter pilot Raffael Klaschka told *AFM*: "We are discussing with the partner nations as to the most efficient approach to LTE. The AMK comprises wing-root extensions and redesigned trailing

Eurofighter vs F-35

Many believe an advanced Eurofighter variant will afford more useful and complementary elements to the Future Combat Air System (FCAS) now under development with France and Spain. The company has described an advanced Eurofighter as "a stepping stone to a European FCAS programme". By contrast, procurement of the F-35 would have threatened the continuation of the entire FCAS project and in particular would have put development of the central FCAS element, the NGF (Next Generation Fighter), in jeopardy.

Dirk Hoke, Chief Executive Officer of Airbus Defence and Space said that any decision to buy the F-35 would have killed off this new Franco-German European fighter: "As soon as Germany becomes an F-35 nation, all co-operation with France on combat jet issues will die." *Jon Lake*

Left: A recently released diagram shows a potential electronic attack configuration. Airbus Right: Electronic attack is a key mission of the Tornado ECR, which the Luftwaffe needs to replace, with the European defence industry keen to see a common fleet of advanced Typhoons fulfilling the role.





Above: The advanced capabilities being proposed include new data links and satellite communications. Left: Several options are being evaluated under the LTE study including a dramatic increase in firepower with expanded weapons carriage.

edge flaps. AMK has already been flight-tested and it's easily installable – it's one option in the LTE packages that we are discussing with our customers. AMK opens up a whole new horizon of capability. The most pronounced improvement relates to weapons integration. We are looking at how to increase the number of missiles to really mass the firepower. A side benefit is more agility and a more relaxed angle-of-attack envelope."

The Eurofighter can currently carry eight air-to-air missiles but there's potential to significantly increase this. "Firepower will play a key role in the future battlespace," Klaschka adds. "Just enhancing the Eurofighter a little further we can make this a real air-to-air monster. For air-to-surface we see improvements in roll rate and [G-force] limitations, but also new asymmetric configurations – AMK will mean the aircraft is more flexible and able to be loaded with a range of stores. The pilot won't even be limited when it comes to the release sequence of the weapons. AMK makes the envelope

even more carefree; you don't even have to worry about the centre of gravity wandering fore and aft." Increased weapons loads will be facilitated by twin ejector racks for inboard wing pylons and for air-to-air missiles, with the AMK opening up the envelope for clearances of those new configurations.

AMK can be retrofitted or included in any new-build aircraft and is just one of the elements Eurofighter is highlighting with regard to capabilities and benefits for partner nations to decide upon. Eurofighter is also planning enhanced data links to open up a new level of situational awareness, as well as satellite communications.

The enhanced HMI includes a new cockpit layout and discussions on a final configuration are ongoing. However, it will be based around a new large-area display. The current cockpit layout and ergonomics have proved to be extremely effective and are now well honed, so Eurofighter is placing emphasis on mission architecture – the 'brain' of the jet – while retaining awareness of the future

potential of elements such as 3D radar displays and completely new philosophies over how a future cockpit might look. There is also a desire to mature such technology in anticipation of the Future Combat Air System (FCAS) with a mindset of risk reduction inserted into these future programmes.

The German requirement

Unofficial reports emerged in the German press on March 26 that the military was moving forward on its Tornado replacement with a split buy of Eurofighters and Boeing F/A-18E/F Super Hornets/EA-18G Growlers. It would mean that the Luftwaffe would procure a new, common fleet of LTE Eurofighters plus approximately 45 fighters from the US.

The Tranche 1 replacement requirement under Quadriga is for new Eurofighters from 2025, with around 36-38 more aircraft. These aircraft would enable a more streamlined force mix if Eurofighter was selected solely to cover the Tornado replacement. Two key roles for the successor to the Tornado ►



Eurofighter Typhoon in focus

An artist's impression of a new cockpit configuration for the Eurofighter, complete with wide-area display.

NO STEP



include the ECR (Electronic Combat and Reconnaissance) variant's suppression of enemy air defences (SEAD) mission and that of nuclear deterrence. Neither of these are current Eurofighter core missions.

Airbus revealed details of a proposed ECR (Electronic Combat Role) variant of the Typhoon at the International Fighter Conference in Berlin in November 2019. The LTE project is designed to underpin the aircraft's status in the future contested battlespace, leveraging what Eurofighter calls 'digital stealth'. In terms of a weapon for the SEAD role, the Eurofighter could incorporate MBDA's new SPEAR-EW weapon, which is being developed in partnership with Leonardo under a Technical Demonstration Programme (TDP) contract awarded by the UK. It's an initiative designed to help stake Eurofighter's claim to the Tornado ECR replacement and remove the need to reach out to the US for the EA-18G Growler, an established electronic warfare specialist.

In March, one of Germany's biggest aerospace

employee unions warned the government that it risked jeopardising the European defence industry if it went with the Boeing option. It said that developing new capabilities for Eurofighter in these specialist mission areas was important in order to retain a skilled workforce needed for the FCAS programme.

The second key area of contention is the nuclear deterrent role. The B61 weapons are held at Büchel as part of NATO's nuclear sharing policy and they are carried by the Luftwaffe's Tornados. A nuclear bomb cannot simply be attached to any weapons pylon – aircraft have to be equipped with special hardpoints in order to carry nuclear weapons with specific wiring and controls. Neither the Eurofighter nor Super Hornet are equipped to carry nuclear weapons, but there is a perception that integration of the US weapons will be simpler on the F/A-18E/F.

CEO Herman Claesen said: "If Europe wants a strong defence and a strong industry to deliver it, then Eurofighter is the best choice."

Its selection would certainly be the best solution for Germany's industrial base, but it would also provide commonality advantages as it embarks on a major effort to upgrade and recapitalise its existing Eurofighter fleet. Selecting Eurofighter to replace Tornado would give the Luftwaffe a 233-strong single-type force until the new FCAS enters service, offering a sensible approach to support costs, as well as significant savings in training and infrastructure. It would also be the stimulus to develop the LTE aircraft and underpin the long-term future of the Eurofighter.

Future prospects

Project Quadriga is not yet signed but the intent is to replace the Luftwaffe's Tranche 1 aircraft with 31-38 new production aircraft (seven two-seaters and 26 single-seaters, with options for five extra single-seaters for a test/development unit). The Quadriga aircraft will include the Mk1 E-Scan radar from the Tranche 2/3 upgrade and a contract award is expected in early 2020 for a production rate of eight to ten aircraft per year.



Above: The advanced electronically scanned (E-Scan) radar is central to new Eurofighter configurations.

Left: The Striker 2 helmet has been developed by BAE Systems and its technology could evolve as a path towards a future cockpit. BAE Systems



Above: MBDA's SPEAR-EW weapon is being developed in partnership with Leonardo under a UK Technical Demonstration Programme (TDP). MBDA

The Quadriga-standard Eurofighter forms the basis of Airbus' offering to meet the new Swiss fighter requirement. The Airbus proposal is for up to 40 Eurofighters to replace Switzerland's existing fleet of F/A-18C/D Hornets and F-5E/F Tiger IIs. If selected, the Swiss Typhoons would be identical to the German aircraft, effectively allowing the two neighbours to pursue a joint procurement, which Airbus says will provide significant economic benefits for Switzerland.

The additional aircraft to replace the German Tornado fleet are likely to be divided into strike aircraft to replace the Tornado IDS and ECR replacements. The Tornado replacement is expected to retain the nuclear capability, in order to allow Germany to continue to meet its NATO nuclear commitment. While it could be argued that integration with the Super Hornet will be more straightforward, Airbus and Eurofighter says feasibility work on the integration of the B61 on the Eurofighter is already under way, while the aircraft's nuclear capability was reportedly demonstrated to the Belgian Air Component

as part of the effort to replace its F-16s.

Addressing the Tornado ECR replacement, the Eurofighter could feature the SEAD-optimised Radar 2 (Mk2) that is under development to meet British requirements. The electronic attack attributes would also suit Eurofighter's ambitions in Finland for the HX competition.

Finland has been offered a Typhoon that is in advance of the current Project Centurion aircraft, which is now the standard across Royal Air Force Tranche 2/3 aircraft in service. Leading the campaign in Finland, BAE Systems is blending in all of the new technology that is in tangible reach of the Typhoon come 2025 including the new Radar 2. Indeed, Finland could be in a position to not only partner on, but also to influence this advanced capability.

Eurofighter LTE is seen as an opportunity to reset the Typhoon story and set it up for the future. Eurofighter GmbH sees a huge growth potential in the decades to come, that will set this potent European fighter on a course to remain credible and capable beyond 2050. **AFM**

German Eurofighter details

Germany originally purchased 143 Eurofighters, comprising 33 Tranche 1 aircraft, 79 from Tranche 2, and 31 Tranche 3 aircraft. These were initially used to replace the F-4F Phantom II in the air defence role, but the Luftwaffe's fourth Eurofighter wing, Jagdbombergeschwader 31 (now Taktisches Luftwaffengeschwader 31) was always intended to assume an air-to-ground role.

The unit converted to the Eurofighter in 2010 and received the Rafael Litening III laser designator pod and the 1,000lb Raytheon GBU-48 (Enhanced Paveway II) as an initial air-to-ground weapon from December 2017.

The Trojan Improved Penetrator (TIP) will soon be added to the GBU-48, giving increased penetration and reduced collateral damage. The new LDP and weapon were integrated under Project ODIN (Operational Developments Intime for NATO), and the Luftwaffe's three remaining Eurofighter wings are now gaining an air-to-ground capability. Germany may add the Boeing GBU-54 Laser JDAM (Joint Direct Attack Munition) in future, as well as some of the weapons integrated under the UK's Project Centurion, perhaps including the Taurus cruise missile and Brimstone.

The Luftwaffe is now planning an ambitious retrofit programme for its 110 Tranche 2/3 aircraft, as well as for 19 Spanish Tranche 3 aircraft. This upgrade will include the integration of a new active electronically scanned array (AESA) radar - the so-called Mk1 version of the Euroradar Captor-E. This is similar to the Radar One Plus (Mk0) being fitted to Typhoons for Kuwait and Qatar, but fitted with a new multi-channel receiver.

Airbus has suggested that the Mk1 E-Scan radar programme will provide Germany and Spain with full national radar sovereignty and will pave the way for the incorporation of new capabilities now being mapped out in the LTE (Long-Term Evolution) initiative, as well as new technologies being developed for FCAS. **Jon Lake**



This model depicts a configuration of the Typhoon that is being offered to Finland for its HX fighter replacement project. Jamie Hunter



Gripen E

on the rise

Saab is accelerating the test programme for its Gripen E fighter as it targets new customers around the world – **Jamie Hunter** reports.



During its annual Gripen Seminar on March 26, Swedish manufacturer Saab revealed details of the progress it is making with its new JAS 39 Gripen E/F fighter. Saab now has six Gripens supporting the flight-test campaign (five Swedish aircraft including the JAS 39D Gripen 'Demo', the first production Swedish aircraft, and one Brazilian aircraft) and it has passed 300 flight hours, according to Eddy de la Motte, the head of Business Unit Gripen E/F. He said the focus of testing is now shifting to tactical systems and sensors: "The sensors we have; the radar,IRST [infrared search and track] and EW [electronic warfare] system, are performing very [well] – better than expected."

Having first been rolled out at Saab's facility at Linköping, Sweden, on May 18, 2016, the new Gripen E is a very different beast to its predecessor the Gripen C. The beefed-up airframe accommodates more fuel, additional weapons hardpoints and an array of new external sensors. Speaking during the online seminar, Eddy de la Motte said the biggest difference comes in terms of the Gripen E's new avionics and overall capability of the complete aircraft, including the integrated sensor suite "that supports the pilot to make great decisions".

Saab has also incorporated model-based design, which enables very short lead times

to upgrades and changes as well as moving away from paper-based design drawings to what Saab calls model-based systems engineering. The Flygvapnet (Swedish Air Force) relies on a relatively small fleet of aircraft (it is purchasing 60 Gripen Es) and must therefore balance technology with tactics and sustainment, with an agile development path, all at an affordable cost.

Saab's joint development test plan for the Gripen E is integrated with the Swedish Defence Materiel Administration, FMV. De la Motte said: "This co-operation with our customer base saves time and brings

a lot higher efficiency. It saves all of us money." This year, Saab plans to deliver two more production aircraft to the domestic customer for the joint verification and validation programme. De la Motte added: "We will start activities at the FMV test centre later this year," which will expand the activities currently centred at Linköping.

Saab won the Brazilian F-X2 competition in December 2013 and is initially supplying 28 single-seat Gripen Es and eight Gripen F two-seaters under a deal worth US\$4.8bn. This includes an impressive transfer of technology wholly embracing Brazilian defence



Above: Gripen E serial 39-10 took part in the HX Challenge in Finland earlier this year. Saab/Harri Koskinen
Left: The first Gripen E for the Swedish Air Force flew in November 2019 wearing an experimental paint scheme. It is not known if this will be officially adopted. All images Saab **Inset:** Saab is eyeing a number of international prospects for new Gripen sales, as detailed in this diagram.



1 companies, generating 14,000 direct and indirect jobs. The first aircraft for the Força Aérea Brasileira (FAB, Brazilian Air Force) customer flew in August 2019 in Sweden. Brazilian test engineers and pilots are currently at Linköping working alongside Saab and the first aircraft will be delivered to Brazil by the end of this year ready to stand up a third test centre for the Gripen E under the Gripen Design and Development Network (GDDN) from 2021.

Export ambition

Saab has taken a proactive stance towards Gripen customers and their ability to be involved with design and development of hardware and software for the new fighter. Indeed, Brazil is the launch customer for

the two-seat Gripen F and this activity is a 50-50 split development between Saab in Sweden and the Brazilian GDDN. The first metal has been cut for the prototype F-model

Gripen E test aircraft

Aircraft	Serial	Role/first flight
Two-seat Gripen 'Demo' (JAS 39D)	39-7	Technology demonstrator
Gripen E	39-8	June 15, 2017
Gripen E	39-9	November 1, 2018
Gripen E	39-10	June 10, 2019
Gripen E (first aircraft for Brazil)	39-6001 (FAB 4100)	August 26, 2019
Gripen E (first serial production aircraft for Sweden)	39-6002	November 2019

by Brazilian technicians working alongside Saab in Linköping (a sub-assembly for the air intake). The prototype Gripen F will be delivered to Brazil in 2023 and it is designed to be able to be used as a training platform as well as providing the extra capacity of a weapons systems officer (WSO) for complex missions, with both cockpits fitted with the new 19 x 8 in (48 x 20cm) touch-screen wide-area display (WAD). Eddy de la Motte said: "The two-seat Gripen F is an important addition to our product line," adding that this also forms a significant part of the offer to Finland for its HX fighter replacement requirement.

In February, Saab deployed a Gripen E abroad for the first time as aircraft 39-10 flew to Tampere, Finland, for the HX Challenge. This was a verification phase for the five competing offerings for the Ilmavoimat (Finnish Air Force) requirement to replace its F/A-18C/D Hornets from 2025. Saab is offering Finland a mix of Gripen Es and Fs, plus its new GlobalEye airborne early warning and control aircraft. De la Motte said: "[Our offer] also adds capability for Finland for MRO [maintenance, repair and overhaul], production of spares, final assembly and a development and sustainment centre to adapt technology to the changing needs of Finland. We understand the importance of controlling critical technology."

Responding to a question of why Saab thinks Gripen offers the best solution for Finland, Eddy de la Motte said: "Flexibility, scalability, modularity, [it is] tailored to customer requirements, with security of supply – it's a perfect fit for Finnish requirements. [It offers] supportability for – and requires very little support for – road base [operations]. It's the support concept, the deployability and the affordability."

Saab is also targeting the Canadian Future Fighter Capability Project (FFCP) and it has formed an industrial team that will support its bid for the CA\$11-15bn contract. It includes IMP Aerospace and Defence, CAE, Peraton Canada and GE Aviation in the bid to supply 88 new jets. De la Motte said the Saab bid in Canada is: "Intended to provide Canada not only with NATO-interoperable aircraft, but also [to provide] long-term high-skilled jobs and a made-in-Canada solution."



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Efficient support

Critical to the appeal of Gripen is an affordable support concept. Ellen Molin, head of Business Area Supply and Services, said the Gripen E concept in this area is scalable, flexible and modular in order to "maintain efficient operations and to maximise time in the air". Gripen is built around a concept of short turnarounds by a small team, which Molin said is: "Part of national doctrine of the countries [Sweden and Finland]." She also referenced the Saab Aeronáutica Montagens (Saab Aeronautics Assemblies, SAM) in São Bernardo do Campo, which will produce Gripen sub-assemblies and is a great example of local support to operations in Brazil, not only Gripen, but for other technical areas too.

Last December, Saab delivered a new mobile support hangar facility to the Magyar Légierő (Hungarian Air Force, HUNAF) when it needed a rapidly deployable capability. Molin said: "This was the first delivery of the deployable maintenance system. It provides enhanced maintenance capacity [for] a home-based maintenance capability when deployed." Saab says it is constantly evolving and looking for new solutions. It is currently developing new container-based solutions for battle damage repair for deployed operations. Using 3D scanning techniques it will be able to 3D print certain spare parts. "If an aircraft is grounded

at a forward operating base, it can solve immediate issues [by making] temporary spare parts [to allow the aircraft to] fly back to main base for formal repair," explained Molin.

Future focus

Sweden currently operates three wings of Gripen C/Ds. Col Torgny Fälthammar says that the Gripen E is designed for "future needs". He said: "We have a strategy that we develop systems and tactics over time." The Swedish Air Force will accept the first Gripen E in 2023, but it is already a part of the joint test and evaluation programme.

Fälthammar said Gripen C/Ds would remain in Swedish service until 2035-40 to maintain readiness through transition to the new Gripen E. He said the air force is "looking at the right balance of C/D and E into the future". It seems the two-seat Gripen D could play a significant role for several years to come, especially with regard to training. Sweden's 1960s-era SK 60 (Saab 105) training aircraft will be phased out over the next five years. Fälthammar said: "[We will] introduce a new basic trainer to combine with the SK 60 for tactical training. As a gap-filler solution [for tactical training] we will use the Gripen C/D." In the long-term, a new advanced trainer will be sought. On March 26, the Swedish government formally authorised the start of the process to procure

the new basic trainer, which will replace the SK 60 in the initial phase of training. The advanced trainer will come later, with Saab's deep involvement with the Boeing T-7A Red Hawk for the US Air Force likely to render it a popular option for the Swedish Air Force. In the meantime, the Gripen C/D will fill the role temporarily as the SK 60 is retired.

The air force is currently formulating plans for the debut Gripen E unit, which will follow the initial deliveries to the FMV and to air force personnel working alongside Saab in Linköping from 2023. It will then spread resources to the first squadron, Fälthammar explained, "balancing the timeframe so we don't have problems with the training of pilots and readiness".

Finland's HX competition is clearly at the forefront of near-term prospects for the Gripen E/F. If the Ilmavoimat selected the aircraft it would clearly deepen co-operation with its neighbour Sweden. Fälthammar said: "Using dispersed bases is an old concept in Sweden to spread our assets and have high survivability. It's Cold War-era, but we still use it today and into the future. The defence commission white paper in 2019 invested in dispersed air bases. Swedish CONOPS [concept of operations] includes short road bases – that's the requirement we strive to keep for the future." **AFM**

1: The Gripen E features increased internal fuel and more weapons stations compared with the C/D variant. **2:** Saab carried out the first flight tests with its new advanced Electronic Attack Jammer Pod (EAJP) in November 2019. The EAJP is designed to protect aircraft against radars by sophisticated jamming functions, to complement the built-in electronic attack capabilities of the Gripen E/F. **3:** The first Brazilian Gripen E will be delivered to South America later this year, and the first two-seat Gripen F will follow in 2023. **4:** A ceremony held for the unveiling of the first serial production Gripen E – from left to right Carl-Johan Edström, Micael Johansson, Peter Hultqvist, Göran Mårtensson, Marcus Wallenberg.



4

Fulcrum



Coded '10 Red', RF-92184 is one of the two veteran izdeliye 9.12A 'flat-back' 'Fulcrum-As' known to be operational with the Erebuni-based squadron. The unit is a component of the 4th Air and Air Defence Army in Russia's Southern Military District. All photos Andrey Zinchuk

survivors *Fulcrum*

Despite rapidly declining numbers, the MiG-29 has soldiered on with the Russian air arm's frontline fleet but, as **Alexander Mladenov** reports, operations with the type are set to stabilise at a relatively low level in the coming decade.



The future of the MiG-29 in Russia will see it remain in use in the aggressor, training and some other secondary roles, while a new-generation derivative is due to be taken on strength for air display and – most likely limited – frontline use.

Today the classic *Fulcrum* – represented by a plethora of sub-variants built and delivered to the Soviet and Russian air arms until 1993 – continues in frontline service with only one squadron, stationed at Erebuni in Armenia. Nevertheless, the fighter is still considered to have some significance with the Vozdushno-kosmicheskiye sily (VKS, Russian Aerospace Forces). A mixture of 'classic' and new-build enhanced *Fulcrums* fly with the two squadrons of the 185th TsBP BPr, a combat training and combat employment centre

stationed at Astrakhan-Privolzhsky airfield in the southwestern corner of Russia. In addition, the ageing type is still used for the advanced training role of student pilots within a single squadron, mainly provided to foreign aircrews.

Numerical strength reduced

As of 2010 the *Fulcrum* had equipped no fewer than 13 frontline, training and air display squadrons with a total fleet of around 200 aircraft. Now, ten years later, it is something of a marginal type in Russian service, fully equipping only five VKS squadrons in addition to a squadron-sized air display team. The number of aircraft currently maintained in active service with the VKS is around 100, while 100 to 150 more are held in long-term storage. These latter are deemed suitable for a structural



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overhaul and small-scale upgrade in order to be made good for sale or free-of-charge transfer to friendly states such as India, Syria or Mongolia. Ironically, most of the ex-Algerian Air Force MiG-29SMT/UBTs – hastily taken on strength by the VKS in 2009 – are also currently being held in long-term storage after their somewhat surprising withdrawal from use in 2017-18 and there are plans, announced only unofficially so far, for their possible sale to India.

At the same time, the long-expected introduction of the new-generation MiG-35 – promoted as a 'Gen 4++' fighter with the VKS – is yet to take place. The type is set to be introduced in small numbers, at least initially, and is still undergoing its notably protracted state flight-test effort. The delivery of the first examples for squadron service is now expected to take place around mid-2020, as the type is earmarked to replace the worn-out 'classic' *Fulcrums* with the Strizhy (Swifts) air display team, based at Kubinka near Moscow. Despite its primary air display tasking, the aircrews of the squadron-sized team also maintain their combat-ready qualifications and the

unit has a place in the VKS order of battle.

A replacement campaign for 'classic' and upgraded *Fulcrums* in frontline VKS units with a more capable and longer-legged type took place between 2013 and 2018. The 120th SAP, a composite aviation regiment stationed at Domna in eastern Siberia's Eastern Military District, was the first to trade its worn-out MiG-29s, serving in two squadrons, for a fleet of 24 brand-new Su-30SMs fielded in 2013 and 2014. Then the 31st IAP at Millerovo in the Southern Military District exchanged its two *Fulcrum* squadrons for 24 Su-30SMs in 2015-16. The last *Fulcrum*-equipped fighter regiment, the 14th Guards IAP at Kursk-Khalino in the Western Military District, swapped its two-squadron fleet of 28 MiG-29SMT/UBTs for 24 Su-30SMs, delivered in 2017 and 2018.

VKS *Fulcrums* in Armenia

The VKS MiG-29 soldiers on in the frontline role at a single location outside Russia, in the former Soviet republic of Armenia. This is the fighter squadron belonging to the 3624th

Aviation Base stationed at Erebuni airfield in the capital Yerevan, a component unit of the 4th Air and Air Defence Army in Russia's Southern Military District. The squadron fields 16 single-seaters, dominated by the izdeliye 9.13 'fat-spined' *Fulcrum*-C, with at least one slightly improved 9.13S and two 9.12A aircraft in addition to a pair of MiG-29UB two-seaters. Currently these jets are on average 30 to 31 years old.

Armenia is a small, land-locked country surrounded by potentially hostile neighbours. In 1995 it signed an agreement with Russia to establish a military air base, with an initial duration of 25 years, extended to 49 years in August 2010.

To begin with, the Russian unit at Erebuni operated a fleet of five MiG-23P fighter-interceptors and one two-seat MiG-23UBs, replaced by 18 MiG-29s in 1998. Since May 2001, the unit has maintained a pair of *Fulcrums* on permanent quick reaction alert (QRA) duty, with the aircraft assigned to the joint air defence system of the Commonwealth of Independent States (CIS). The *Fulcrum* squadron is also tasked to provide

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air cover to Russian land forces units of the 102nd Military Base stationed in Armenia, and also could provide close air support, employing unguided air-to-surface ordnance.

The important status of this air base outside Russia's borders made the squadron at Erebuni the most active frontline VKS MiG-29 unit in the 2010s. It was clearly prioritised for supplies of fuel and spare parts as well as maintenance, repair and overhaul services. It was therefore able to maintain very high serviceability for its otherwise aged *Fulcrum* fleet, and as a consequence its aircrews attained a fairly high level of combat readiness.

According to Colonel Alexander Petrov, commander of the 3624th Aviation Base since 2011, the MiG-29 squadron conducts training flights three or four times a week and maintains a constant state of high combat readiness. The young pilots posted to Erebuni log 100 to 120 flight hours annually, while the experienced MiG-29 drivers and instructors receive 100 to 110 flight hours. This equates to more than 200 sorties a year per pilot as the average duration of the training sorties here is between 25 and

30 minutes. The highest-level qualifications maintained by the aircrews of the Erebuni-based *Fulcrum* squadron include air combat manoeuvring 1-v-1 and 2-v-2 at low level – down to 984ft (300m) – and basic fighter manoeuvres in a four-ship formation. As Colonel Petrov stated, there are two four-ship flights, staffed by the most skilled pilots, who are additionally trained for 4-v-4 air combat manoeuvring.

Since 2013, the squadron has also practised routine training in the air-to-surface role using the *Fulcrum*'s 30mm built-in cannon, freefall bombs and 80mm (3.15in) calibre rockets, at the Marshal Baghramyan firing range owned by the Armenian defence ministry.

Between 2013 and 2018, the Erebuni-based squadron took a number of overhauled MiG-29s on strength. These featured updated communication and navigation equipment, but no further details have been revealed. According to Russian defence ministry reports, four freshly overhauled MiG-29s and one enhanced MiG-29S were accepted by the Erebuni-based unit in February 2016 and two more aircraft followed suit in July 2018.

There were also announcements regarding an undisclosed quantity of overhauled MiG-29s delivered in February 2014 and another batch that was delivered in August 2015.

Colonel Petrov observed that flying is much more complex and difficult at Erebuni than in Russia. The small-size airfield is situated in a densely built suburb of Yerevan and is also surrounded by high mountains on all sides. The airfield elevation is 3,270ft (998m) above sea level and most of the flight training areas utilised by 3624th Aviation Base aircrews are situated above mountains with numerous peaks, the tallest of which rises to around 12,120ft (4,000m). As a result, all air combat manoeuvring and practice aerobatics sorties are flown with the floor set above 12,120ft. In turn, all the low- and ultra low-altitude training sorties are performed overhead Erebuni.

In February 2017, Colonel Petrov told the Russian press that the 'classic' and seriously ageing *Fulcrums* at Erebuni are set to be superseded in the foreseeable future by the new-generation MiG-35, but the slow pace of the test and evaluation programme has rendered these plans



1: This 'fat-spined' MiG-29 izdeliye 9.13 'Fulcrum-C' belongs to the fighter squadron of the 3624th Aviation Base, stationed at Erebuni airfield. The squadron was the most active frontline VKS MiG-29 unit during the 2010s. 2: A 'Fulcrum' stands on QRA duty at Erebuni, armed with a pair each of the R-27R and R-73 air-to-air missiles. The air force's sole frontline squadron equipped with 'classic' MiG-29s maintains round-the-clock QRA to police Armenian airspace and provide air cover for Russian military units stationed in the country. 3: This 'flat-back' MiG-29 (izdeliye 9.12A), wearing the distinctive badge of the Astrakhan-based 185th TsBP BPr combat training and combat employment centre, rests on the ramp armed with R-27R semi-active radar-homing missiles. These will be used for practice live firings against aerial targets at the nearby Ashuluk range complex. 4: A total of 14 MiG-29SMT(R)s, received in 2015 and 2016, replaced earlier 'Fulcrums' that were in the worst technical condition within one of the component squadrons of the Astrakhan-based 185th TsBP BPr.



1

impossible. In the best-case scenario, if the long-awaited MiG-35 contract is signed this year, it may be predicted that the first aircraft could arrive with the 3624th Aviation Base by 2022 at the earliest.

Combat training centre

The MiG-29 is the only fast jet type operated by the two squadrons of the 185th TsBP BPr. Stationed at Astrakhan-Privolzhsky airfield in southern Russia, not far from the Caspian Sea, this organisation is responsible for the combat training and support of combat-readiness inspections of the VKS fighter and ground-based air defence (GBAD) branches, conducted on a regular basis at the nearby Ashuluk range complex.

The centre's 1st IAE flies newly built MiG-29SMT(R) single-seaters and MiG-29UBM two-seaters, taken on strength in 2015 and 2016, while another squadron, the 2nd IAE, is outfitted with 'classic' single- and two-seat aircraft, produced in the late 1980s. The total *Fulcrum* fleet numbers between 25 and 30 aircraft in active use.

The contract for 14 newly produced single-seat 'humpbacked' *Fulcrums* for the Russian air arm was signed on April 15, 2014, at a reported price of around US\$530m. All the aircraft covered by this contract – and built at RAC MiG's plant in Moscow – eventually went on to serve with the 185th TsBP BPr.

These new-build *Fulcrums* – known within RAC MiG as izdeliye 9.19R – used

existing airframes that dated back to the early 1990s and that had been kept in deep storage for nearly two decades.

In addition to the enhanced single-seaters, the 185th TsBP BPr took a pair of new-build MiG-29UBM two-seaters on strength in December 2015; known as izdeliye 9.53R, these were rolled out at RAC MiG's Sokol plant in Nizhny Novgorod.

The centre's principal mission is to train VKS fighter pilots in advanced combat techniques and support fighter and surface-to-air missile (SAM) units during their simulated and live missile firing practice and combat readiness inspections, conducted at the Ashuluk range. VKS fighter units from all military districts deploy to Astrakhan-Privolzhsky for their scheduled live-firing practice and training exercises to check the combat readiness of their personnel.

The MiG-29s at Astrakhan-Privolzhsky are mainly used as aggressor aircraft during the dissimilar air combat training (DACT) missions preceding the live-firing practice at the end of the training deployment of the frontline units. The pilots from the centre are tasked with evaluating the air combat skills of the aircrews from the visiting fighter regiments in complex beyond- and within-visual-range engagement scenarios.

As well as its primary aggressor/training tasking, the 185th TsBP BPr also maintains a meaningful frontline role. Since March

2001, its MiG-29s have been placed on full-time QRA with four aircraft armed with air-to-air missiles, covering the southwestern air borders of Russia, plus the adjacent airspace over the Caspian Sea. In 2017, three MiG-29SMT(R)s were deployed on a test and evaluation campaign in real-world combat conditions in Syria, operating mainly in the air-to-surface role.

Among the list of secondary routine tasks carried out by the 185th's MiG-29s is the provision of support to the testing and evaluation campaigns for new or upgraded GBAD, radar and electro-optical systems, taking place at the Ashuluk range complex. For these rigorous test and evaluation efforts, *Fulcrums*, together with An-26 transports and Mi-8 helicopters, also belonging to the centre, are used to simulate both manoeuvring and non-manoevring air targets. Flying at varying speeds and altitudes, the *Fulcrum* crews check the detection and tracking performance of the GBAD and air surveillance systems against high-speed targets.

Crewed by the most experienced pilots, MiG-29s from Astrakhan are also tasked with the range safety role, undertaken on a routine basis during all live practice or test missile firings conducted at Ashuluk by other fighter or GBAD units. During the live missile firing sessions, the armed *Fulcrums* loiter in close proximity to the firing area, ready to immediately launch an intercept and shoot down a remotely controlled



4



1: The initial airframe service life limit set by RAC MiG for the 'classic' MiG-29 is 2,500 flight hours and/or 20 years, whichever is reached first. Airframe structural overhaul is required every 1,000 hours or after ten years of operation. That service life has now been increased to 3,500 hours and 30 years. This is a two-seat MiG-29UB assigned to the 185th TsBP BPr at Astrakhan-Privolzhsky. 2: The MiG-29SMT(R) seen here features an all-Russian mission equipment suite. In contrast, the ex-Algerian Air Force aircraft – inducted to Russian service in 2009 and 2010 – were outfitted with foreign avionics, including the French-made Sagem Sigma 95N inertial navigation system with integrated GPS receiver. 3: A 'flat-back' MiG-29 takes off from Astrakhan revealing reinforcement patches on both sides of the fins – an effort to eliminate serious structural integrity problems caused by corrosion. These problems gained publicity in 2009 following two 'Fulcrum' crashes caused by fin separation in flight. 4: A MiG-29SMT(R) on its landing roll, with the brake 'chute deployed.



2

aerial target should one go out of control and deviate from its assigned flight path.

Since 2018, as Colonel Alexey Rotko, chief of the 185th TsBP BPr revealed, the centre's *Fulcrums* have begun practising intercepts of small-size aerial targets, similar to the makeshift UAVs used by the Syrian anti-Assad armed opposition for strikes against Khmeimim air base. The centre has embarked on an experimental programme for detection, tracking and destruction of this class of small-size aerial targets, flying in swarms, using its new MiG-29SMT(R)s in addition to MiG-31BM and MiG-35 fighters, most likely operated by the 929th GLITs at nearby Akhtubinsk. The fighters were employed in October 2018 to intercept unidentified slow-speed/small-size drones, similar in size and performance to the 'home-made' bomb-laden examples encountered in Syria.

In addition to the air-to-air mission, the MiG-29SMT(R)s at Astrakhan-Privolzhsky are regularly used for strike missions, practising the employment of freefall bombs in addition to S-8 and S-13 rockets. To date, there is no information about the employment of guided air-to-surface munitions.

As Colonel Rotko revealed to the Russian defence ministry's official newspaper, *Krasnaya Zvezda* (Red Star), there are very strict entry requirements for pilots applying to serve with the centre. The 185th's command authorities prefer to hand-pick aircrew from the best fighter pilot graduates at the Krasnodar Military Pilot

Higher Aviation School, colloquially known by its Russian abbreviation KVVAUL. They graduate on the Yak-130 jet trainer at the KVVAUL's 2nd Aviation Facility at Armavir with 200 to 210 flight hours under their belts. The young lieutenants posted to the 185th TsBP BPr then undertake conversion to the MiG-29 upon arrival at Astrakhan. According to Colonel Rotko, these promising lieutenants undergo an accelerated combat training course to achieve full combat-ready status in three years. Initially, they master the 'classic' *Fulcrum*, and only convert to the much more capable MiG-29SMT(R) when they are deemed skilled enough.

The enhanced *Fulcrum* derivative operated by the 185th TsBP BPr since 2015 is outfitted with all-new and much more capable mission avionics suite and weapons options than the 'classic' MiG-29s. The MiG-29SMT(R)'s principal onboard sensor is the Phazotron-NIIR FGM-129 Zhuk-M mechanically scanned slotted-antenna pulse-Doppler radar, the same as that integrated on the MiG-29K/KUB, MiG-29M/M2 and MiG-35, enabling the use of the R-77-1 active radar-guided beyond-visual-range air-to-air missile. In the air-to-air mode, the new radar boasts a multiple-target engagement capability, which the 'classic' MiG-29 versions lack. The Zhuk-M's claimed maximum detection range is around 93 miles (150km) and acquisition range is 75 miles (120km) against a fighter-size target in a head-on attack.

The radar also offers a variety of air-to-

surface modes with a maximum detection range against large-size ships extending to 186 miles (300km) and it also features the high-resolution terrain-mapping function.

The SPO-150-1 Pastel' radar warning receiver is another new sensor with expanded functionality, capable of targeting for the Kh-31A anti-radar missile. The MiG-29SMT(R)'s enhanced self-protection suite incorporates a built-in radar jammer of unidentified type and downward-firing UV-5-08(50) countermeasures dispensers installed side-on, next to the engine nacelles, complementing the upwards-firing dispensers accommodated in extensions located forward from the base of the fins. **AFM**

Coming up

In the second part of this feature, AFM will profile the new-generation *Fulcrums* for the VKS.

Abbreviations

IAE	Istrebitelnyi aviatsionnyi eskadriya	Fighter Aviation Squadron
IAP	Istrebitelnyi aviatsionnyi polk	Fighter Aviation Regiment
GLITs	Gosudarstvennyi lyotno-ispytatelnyi tsentr	State Flight-Test Centre
SAP	Smeshannyi aviatsionnyi polk	Composite Aviation Regiment
TsBP BPr	Tsentr boyevoy podgotovki i boyevogo primeneniya	Combat Training and Combat Application Centre



1 Attack helicopters

While high-end, dedicated attack rotorcraft are normally the preserve of only the best-funded air arms, helicopters equipped for close air support are increasingly commonplace. Air Power Association President, **Air Marshal (ret'd) Greg Bagwell CB CBE** examines the pros and cons of rotary-winged platforms as a means of delivering air power.

Air power started out very much as a means to support troops on the ground. However, as aircraft became faster and rather more preoccupied with each other, the arrival of the helicopter became a natural extension of the war on land and, while most armies in the last 100 years have relinquished control of any significant numbers or types of fixed-wing aircraft, many have firmly established helicopters within their inventory. Although the greatest proportion of these rotorcraft are usually utility helicopters, primarily configured to move troops quickly across the battlefield, many modern armies are equipped with the lighter but far more sophisticated attack helicopters. As modern land warfare has become increasingly dominated by fire and manoeuvre, rather than a static defence or the use of overwhelming mass, these have emerged as the most potentially lethal equipment on the battlefield. Indeed, in the last few decades, they have become as vital to armies, if not more so, than the tank.

A rotary-wing attack platform offers armies two significant advantages over fixed-wing air support. The first is that they are usually under the exclusive ownership and control of a land formation – their availability is, therefore, far more assured by being under direct command and control. Airmen have long argued for centralised control of aircraft (or

the pooling of air assets) in order to maximise efficiency, but this has often been mistrusted by soldiers who are nervous of seeing their priorities being superseded. So, ownership matters; helicopters are invariably totally integrated into a land commander's plan in a way that fixed-wing aircraft can never be. Of course, this means that armies need to absorb the significant cost of both buying and maintaining a sophisticated fleet of helicopters, so that ownership doesn't come cheap.

Firepower on demand

The second and more obvious advantage of attack helicopters is how well matched they are to the pace and nature of the land battle. Indeed, only a highly specialised aircraft like the A-10 can offer something even close to the qualities of an attack helicopter. While a fixed-wing aircraft is always quicker, helicopters are normally fast enough to respond to a situation on the ground, especially if they are forward located close to the land formation they are supporting – the obvious advantage being they don't need the infrastructure or runways that fixed-wing aircraft do. Importantly, they have the ability to hold position and/or escape detection using cover and nap-of-the-earth flying to avoid being targeted and increase surprise. This ability to poise when combined with a combination of multiple onboard weapon systems is a huge advantage over a





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“As modern land warfare has become increasingly dominated by fire and manoeuvre, rather than a static defence or the use of overwhelming mass, attack helicopters have emerged as the most potentially lethal equipment on the battlefield.”



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1: The Turkish Aerospace T129 ATAK is typical of modern attack helicopters: a tandem two-seat, highly agile and well-protected machine, armed with a 20mm gun in the nose and with additional weapons carried on four hardpoints, two on each of the stub wings. Turkish Aerospace 2: Close support to troops is what an attack helicopter does best. In this case, it's an AH-129 Mangusta from the Italian Army's 7^o Reggimento 'Vega', taking part in a raid by the Brigata Aeromobile 'Friuli' during the Airmobile Permanent Training II exercise in 2017. Italian MoD 3: An A-10C strafes a target at the Barry M Goldwater Range in Arizona on February 11, its 30mm cannon firing up to 3,900 rounds per minute. While a fixed-wing asset like the 'Warthog' can be on the scene quicker, only a handful of such highly specialised aircraft types are currently in service. USAF/Senior Airman Jacob Wongwai 4: A British Army Air Corps Apache AH1 lights up the night sky with a salvo of CRV7 practice rockets delivered against targets at Lulworth Ranges/Bovington Camp, Dorset. The two-day live firing exercise involved pilots from Middle Wallop, Hampshire, who gained qualifications as instructors. Crown Copyright 5: Two US Marine Corps AH-1Z attack helicopters - with another pair of UH-1Y utility machines behind them - prepare to lift off during a live-fire exercise at Hawaii's Pohakuloa Training Area in February last year. The rotorcraft, assigned to Marine Light Attack Helicopter Squadron 367, provided close air support by firing missiles and machine guns, as well as working with USAF A-10s. USMC/Sgt Jesus Sepulveda Torres



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Left: The Soviet-designed Mi-24 'Hind' series has proven to be the most widespread attack helicopter and has seen action in countless conflicts around the globe. These examples are AH-2 Sabres operated by the Brazilian Air Force from Base Aérea de Porto Velho in the upper Amazon River basin. Paulo Rezende/Força Aérea Brasileira **Below left:** A US soldier in front of a Bulgarian SA-8 'Gecko' self-propelled surface-to-air missile during the SHABLA 19 joint live-fire exercise in Bulgaria last June. This Soviet-era air defence system has now been joined by a range of more advanced equipment that outranges most attack helicopters' onboard weapons. US Army Europe **Below right:** The shape of things to come? The Raider X is the Lockheed Martin/Sikorsky entrant in the US Army's ongoing Future Attack Reconnaissance Aircraft competition. The design lifts pioneering technology from Sikorsky's X2 experimental high-speed compound helicopter, which was flown at speeds exceeding 250kts. Lockheed Martin



fixed-wing platform. Aircraft need to maintain forward motion to stay airborne and this poses a number of limitations when attacking a mobile target. Firstly, they have to detect, identify and then aim in one swift motion; this usually means the weapon type has to be pre-determined and there is only a fleeting opportunity to prosecute one target on each pass and a subsequent re-attack may take a number of minutes as the aircraft repositions. Helicopters have no such limitations; they can engage a number of targets in a very short period and have the time to carefully identify the target and select from a full weapon armoury in order to choose a best match. A rotorcraft can even take the time to finesse its firing solution to optimise the position and angle on the target. In essence, an attack helicopter's

effectiveness is only limited by the speed of reaction of its crews and the availability of targets.

Capability at a cost

But just as attack helicopters have some advantages over fixed-wing aircraft, they do have limitations. Firstly, they are not a cheap option; while you might get three AH-64 Apache helicopters for the price of a Typhoon or F-35, they only perform a single specialist role, and in an army's budget, the cost of one Apache could buy you eight Challenger 2 tanks or 20 AS90 self-propelled artillery pieces. Moreover, due to their increased sophistication over a utility helicopter, their logistic tail and supporting infrastructure are significant enough that a fixed basing option is not unusual, which negates their

mobility and proximity advantage somewhat. Finally, they are increasingly vulnerable to modern tactical surface-to-air missile (SAM) systems, which are becoming ever more lethal and which possess significantly greater ranges than the weapons of the helicopter.

On balance, however, and in the right scenario, attack helicopters can be deadly, and a deciding factor in a fast-paced mechanised land battle. Their survivability will continue to be challenged as will their speed of response. However, the US Army's Future Attack Reconnaissance Aircraft (FARA) programme is now looking to test the boundaries of what is possible and should be the one to watch. **AFM**

Next Month *Strategic bombers*



The first pre-series Ka-52K shipborne attack helicopter lifting off for its maiden flight at the AAC Progress factory airfield in March 2015. The Ka-52K is expected to operate from the Russian Navy's two future large amphibious assault ships, each capable of accommodating of up to 16 helicopters. AAC Progress



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Normal day-to-day training for the 18th Aggressor Squadron (AGRS) 'Blue Foxes' might involve eight to ten jets participating in a mission from their Eielson home base – but briefs and debriefs are considerably less time-consuming than during a Red Flag – Alaska exercise (see part one, April, p92-97). Planning takes place a day prior to mission execution. The various elements – mission type, desired learning objectives (DLOs), threat-replication requirement, safety, airspace planning and deconfliction – are studied in minute detail, but on a much smaller scale compared with a Red Flag.

On a typical training day, the primary customers of the 18th AGRS are the two squadrons of F-22As – the 90th Fighter Squadron (FS) 'Dicemen' and 525th FS 'Bulldogs' – of the 3rd Wing at Joint Base

Elmendorf-Richardson (JBER) near Anchorage. Capt Travis Worden, a second assignment flight lead with the 18th AGRS explained: "We fly against them almost every single day and provide them with very specific, tailored feedback. We are like: 'What are you guys trying to do today and how can we mess that up for you and provide you with the best lessons learnt?' We have to be as wily as we can. The brief and debrief timelines are compressed when there is less data and fewer jets – it typically takes 30 minutes instead of a couple of hours [as it would for Red Flag – Alaska]. During winter, the day is short but when it is long, you try to accomplish the other jobs that you have."

Some of the units that descend on Eielson spend additional time at the base before or after a Flag. The 18th AGRS then are free

agents and if visiting units have specific DLOs the aggressors will fly with them and cater to their requirements. This training around a Red Flag is known as Distant Frontier.

Globetrotters

The 'Blue Foxes' are globetrotters in the literal sense. They form Mobile Training Teams (MTTs) and travel all over the world – the Nellis aggressors are unable to travel as widely since the majority of their customers are either at or close to the Nevada base. The 18th AGRS goes to Guam at least once or twice a year for either Cope North and/or Valiant Shield exercises. The unit also travels to Australia for the Air Warfare Instructor (AWI) course's Exercise Diamond Shield; AWI is the Royal Australian Air Force version of the USAF Weapons School. They also support coalition partners including

Bandits of the last fro



Know, teach, replicate

Maj Lloyd 'Bond' Wright described the 18th AGRS mission as one of "know, teach, replicate". He explained: "The replication is the flying portion. Teaching also falls under replication, but there is another aspect of teaching that comes under the 'know' part. This is the Subject Matter Expert or SME programme. We have experts – literally the only experts in all of PACAF on, for example, enemy doctrine, or fighters. Their job is to be the smartest dude on that subject, period – to know everything from every source we can possibly find, including all the resources available to the US and its allies to make this as accurate and as applicable to our Combat Air Forces as possible.

"We spend weeks preparing these briefs and rigorously tear each other apart on how poorly or well we have made them. The goal is to make the guy not only knowledgeable but also to make him *sound* knowledgeable. There is a difference between knowing and being able to explain. We take a lot of pride in our ability to do that. We send guys literally across the globe – for example to Norway, Germany, the UK, Canada, Japan, Australia – to both gather and disseminate data. We tailor the briefs to be meaningful and focused on what things are important from a fighter squadron perspective."

Japan, Singapore and South Korea, helping to train their air arms against common threats.

The reality is that not every nation gets to attend Red Flag – Alaska or Red Flag at Nellis, so the 18th AGRS takes the opportunity to step outside the Alaskan winter and fly in more temperate climates around the Pacific Air Forces (PACAF) region. The logistics and planning required for transoceanic movements are enormous. Capt Worden elaborated: “When you are deploying an entire squadron of 12 jets to a new location, it’s far more involved than simply taking the jets and pilots to that location. I cannot reiterate enough: these operations require hundreds of people and millions of dollars. We have echelons of leadership that co-ordinate that effort from the operations, maintenance and logistics side; that starts six months to a year prior to us leaving ▶



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PART TWO

Kedar Karmarkar concludes his Alaskan assignment with the 18th Aggressor Squadron at Eielson Air Force Base before joining the ‘Blue Foxes’ for the Sentry Aloha exercise in Hawaii.



Above: Photographed taking off during Exercise Sentry Aloha earlier this year, F-16C 86-0301 ‘AK’ of the 18th AGRS wears the ‘lizard’ aggressor scheme. The jet carries inert AMRAAM (on the wingtip) and AIM-9M missiles. Top: The scene in the shelter at Eielson as pilot ‘Jackal’ discusses the next mission with ground crew. Inspired by the 1975 film ‘Monty Python and the Holy Grail’, the crew call ‘Have at you!’ in unison after briefing for an air-to-air fight. All photos Kedar Karmarkar

18th Aggressor Squadron

1: Awaiting its next mission in a shelter at Eielson, this is F-16C 86-0305 'AK'. This was the first airframe to receive the Arctic camouflage scheme, in late 2007, shortly before its transfer from Kunsan in South Korea to the newly established 18th AGRS. 2: Arctic-camouflaged F-16C 86-0304 'AK' taxis into the night at its Alaskan base. Airmen deployed to Eielson AFB call themselves 'Icemen' due to the extremely cold weather. 3: Serial 86-0298 'AK' is a 'Blue Foxes' F-16C, wearing the blue splinter scheme, at its home base of Eielson, Alaska. The 18th AGRS operates 19 Block 30 F-16Cs and two F-16D two-seaters that wear a variety of camouflage patterns.

"They get a huge training benefit by having us here, for two reasons – we bring professional threat-replication expertise and we fly the F-16C, so they are exposed to dissimilar air combat."

Capt Garret 'Shadow' Wilson

and culminates in bringing our training and expertise throughout the Pacific theatre."

There are challenges associated with working with foreign nations, especially in terms of communications. Since the training the aggressors provide is highly specific, they have to carefully select their words to ensure everyone understands them. The main focus of training with allied nations is interoperability. Maj Lloyd 'Bond' Wright, assistant director of operations at the 18th AGRS, reflected: "It's funny to watch day one of a Red Flag, where you have a mix of four units, for example a unit each from the Japan Air Self-Defense Force, Republic of Korea Air Force and US Air Force acting separately and who have not integrated well – we aggressors dominate them. But then

they learn, and communication barriers are overcome after the first day and things start getting in sync. By day ten, the Red Air is getting decimated and Blue Air is running like clockwork. It is really gratifying to watch that progression. The challenges mainly lie around language but everyone that comes [to Red Flag] wants to learn. They want to be lethal and better, so you don't have to worry about people not caring or slacking. It's just getting around how they synchronise to achieve a mission set collectively."

Sentry Aloha

The Alaskan aggressors also participate in Exercise Sentry Aloha, training with the Air National Guard (ANG) Raptor units at Joint Base Pearl Harbor-Hickam (JBPHH) in Hawaii. For

this year's iteration, the 18th AGRS took off from Eielson in -40°C (-40°F) and landed at JBPHH in 27°C (80°F). *AFM* spoke to 'Blue Foxes' pilot Capt Garret 'Shadow' Wilson to discuss Sentry Aloha 2020-01. "It took us about six and a half hours to go straight from Eielson AFB to JBPHH, mainly due to the fact that the tankers 'drag' us at their speeds. We refuel often, keeping in consideration divert airfields in case of emergencies."

Comparing the size of Sentry Aloha to Red Flag – Alaska, Capt Wilson said: "Scale is small here compared to Red Flag – Alaska, but we are still using the same number of jets and similar tactics. As far as planning goes, it is a bit different. In Alaska we have our designated CTS [combat training squadron] whose mission is just to plan. They are experienced, and meticulous. They are more used to planning on the scale of Red Flag – Alaska. Here in Hawaii it is the home unit that does the planning. They have a local central unit that acts like a pseudo CTS. They do an excellent job, but of course they are less experienced with large-force exercises. The pace is similar but scaled down since there are fewer scenarios to practice and a smaller number of jets compared to Red Flag – Alaska."

Most Sentry Aloha flying is over water, making use of the vast expanses of the range over the Pacific. Capt Wilson continued: "Fighting over water is a lot different; open ocean is a bit tougher since there is no terrain masking that we can use but we stick to our standard





replication tactics, so it's not a big change for us from the aspect of flying. Since there are no SAM [surface-to-air missile] simulators in the open ocean the scenarios here are mostly OCA/ DCA [offensive and defensive counter-air]."

Capt Wilson stressed the importance of having aggressors fight with ANG units: "Here in Hawaii, there are only Raptor [fighter] units and they do not get that many chances to deploy elsewhere and fight alongside fourth-generation fighters. They get a huge training benefit by having us here, for two reasons – we bring professional threat-replication expertise and we fly the F-16C, so they are exposed to dissimilar air combat. The other bonus the Guard units get is the chance to fly with us as 'augmentees' and act as Red Air, thereby getting an insight into

what it takes to fly and fight like an aggressor."

AFM also spoke with Capt Benjamin 'Scoff' Martin, an F-15C pilot from the 194th FS 'Griffins' of the California ANG's 144th Fighter Wing, who had an opportunity to fly with the aggressors as Red Air during Sentry Aloha. He explained: "Frequently in large-force exercises, the aggressors do not have the airframes they need to simulate mass enemy formations and they borrow airframes from the Blue Air. We do Red Air as well. We 'gave' two jets to the aggressors; I flew yesterday as Red. The controlling is different, they generally use BRA format – bearing, range, altitude from your own ship. [It's] different from Bullseye, which is a particular point in space that everyone refers to on the Blue side. It is much easier with

the BRA format, but the huge difference is a lot less autonomy. They are very GCI-centric where the GCI [ground control intercept] tells you what to do, whereas here the controller gives you input and they give you threat calls, range calls, picture calls – all the information that can help you decide the best course of action and you execute on your decision."

The 'Blue Foxes' are also asked to go down to Marine Corps Air Station Miramar, California and train with the US Marine Corps' resident 3rd Marine Aircraft Wing. Once a year they also travel to Nellis and link up with the 64th AGRS to support them in their missions and to standardise or update tactics. Maj Wright gave more details of how they function with the 64th: "We are very similar in many ways. We work on the same Aggressor Threat Replication Guide. We replicate the same way using the same jets. We have the same flying standards and have combined our standards to the minutest details, like 'This is how you get in the jet, this is how you get out of the jet'. We are very similar in the mission set that we do in terms of training Blue in the most accurate way. All our briefs and debriefs are very similar and we 'trade' people when manpower is short; the procedures are interchangeable enough that we can do that."

The 'Barons'

The ground control intercept (GCI) controllers – known as 'Barons' – make an invaluable





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contribution to the work of the 18th AGRS, as Capt Worden explained: "Barons in the Red Air world are in a unique position to capitalise on Blue Air mistakes. We use them primarily in a safety role, but they are a tactical execution force-multiplier. They are trained to enable us to execute at a level at which we are able to pull apart chinks in the Blue Air game plan when they present themselves. It's a powerful weapon as far as training the CAF [Combat Air Forces] is concerned. They are embedded with us and work with us closely. We consider them as our number five in a four-ship formation."

Since Baron controllers have typically been Blue Air or CAF controllers in the past, they know what Blue tactics to expect and have the whole picture in front of them as the battle unfolds. If they identify a potential weakness opening up in the Blue Air game plan, they advise the aggressors who exploit it, while staying in the realm of

accurate threat replication. Baron controller TSgt Wesley Miller told AFM: "If we see a

mistake in Blue tactics, then we will modify [our own tactics] and what we call 'punish' the Blues' mistakes. At the end of the day, this is why we are here – to expose weaknesses and give them an opportunity to fix their tactics. Also, since we work closely with the pilots, the Barons are given a lot of room to make audibles and make changes to the play. As the flight leads trust their wingmen, that same trust is shown in us by them and they will acknowledge and follow our lead to make the training effective. Even if the replication scenario prevents the exploitation of that weakness depending what the aggressors can or cannot do that day, the Barons still take notes. In the mass debrief when the mission review is played back, we can stop it and say: 'This is what we are seeing, this is what we would do if we were able to replicate it, and even though we did not punish you today this is a weakness in your game plan that an adversary might exploit in real life.'"

Becoming a bad guy

In the past, aggressor selection was broadly

"Being an aggressor is a different beast. The mindset shifts from 'We are going to take out the bad guys with ruthless relentless force' to 'We are now the bad guys.'"

Capt Travis Worden



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process-oriented. If you applied for the role, personnel from the relevant AGRS would come out and observe you in your day-to-day job – how you prepare for a mission, brief and debrief. They would select a candidate based on that information and on endorsements from superiors. These days, with manning shortfalls and cutbacks, personnel are more likely to be selected based on their superior's endorsement.

Capt Worden joined the aggressors after his first assignment at Osan Air Base, South Korea: "Joining the elite band of aggressors these days is a standard assignment process. It is an option for your next assignment and is pretty much based on your leadership's feedback on you as a fighter pilot." However, there's a mental shift in a fighter pilot's mind when transitioning from the CAF to the aggressors. Capt Worden elaborated: "Being an aggressor is a different beast. The mindset shifts from 'We are going to take out the bad guys with ruthless relentless force' to 'We are now the bad guys.' Our job is to guide and



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coach those good guys towards the lessons required to succeed in combat. As a result, winning for Red Air goes from a gung-ho 'We destroyed them' mentality to a quiet humility in the sense of knowing that maybe Blue Force did not do well today but they are better for it. I think it is a more mature perspective to have, but one that can be far more fulfilling than flying the Blue Air mission."

Becoming a Baron

The path to Baron controller is more complex. The methods of controlling fighters within the CAF are very different to operating aggressors. In the CAF, pilots work with greater autonomy; they will take all the information the controller provides and formulate their own air-to-air tactics. Meanwhile, command and control (C2) assets provide them with updates on the scenario as they request it.

In the aggressor realm, a Baron not only gives the pilots information but also directs what each individual should do. For example,

they may direct one flight to a target and call for the other to react to a threat or abort. Rather than a long conversation on the radio providing the whole picture, short snippets tell each flight or pilot what to do.

On average it takes between five and six months to earn an initial Baron qualification and another six months to become fully proficient. It can take slightly more than a year for a new Baron to fully understand the system and processes, including long hours of theory and discussions on tactics control and airspace.

While the Barons use some of the CAF's communications standards, they also have their own, so they need to relearn 'radio speak' when controlling the aggressors.

There are upgrades for the Barons, too, beginning with a basic level of control and moving up to Red Flag standard, which includes the ability to handle more aircraft and manage complex scenarios. It takes a couple of years for a new Baron to achieve the Red Flag level. TSgt Miller continued: "The biggest issue we

have for controllers that show up here is they are afraid to tell the pilots how to execute since we are not used to that in the CAF. It is a complete mental shift and as Barons we need to show that we understand the tactics and that when I tell them to do something that it makes sense. Even though we are not actually flying the aircraft, we are as much involved in mission planning as the pilots are. It is imperative that the Barons fully understand the flight lead's intent. That way, if everything else fails, as a Baron I know what we are trying to execute, and I can direct the pilots accordingly"

The reverse is true for controllers leaving the aggressor world and heading back to CAF units. If the Baron was an experienced Blue Air controller before joining the aggressors, the transition back to the CAF is not normally a big challenge. If the outgoing Baron was a junior in the CAF when he joined the aggressors, then it can be a little tough – there is a process of unlearning Baron procedures and getting back up to speed on the CAF's C2 techniques. ▢



4 F-16C 86-0295 'AK' in the so-called BDU (Battle Dress Uniform) splinter scheme on the Sentry Aloha ramp. Behind the jet is one of ATAC's Hunter adversary jets. **2:** The 18th AGRS's 'fox' sign is flashed from the cockpit of Arctic-camouflaged F-16C 86-0320 'AK' as it taxis at Eielson. This summer, the base will also start to receive two squadrons of F-35As. **3:** Callsign 'Jackal', one of the 18th AGRS pilots, taxis at Eielson in immaculate F-16C 86-0308 'AK', another of the unit's jets wearing the blue splinter scheme. Note the centreline AN/ALQ-188 jamming pod. **4:** F-16C 86-0268 'AK' was among the squadron's jets involved in the latest Sentry Aloha, during which it was photographed preparing to take off from Joint Base Pearl Harbor-Hickam. The 18th AGRS is tasked with providing critical combat training around the globe.



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Working remotely

One of many challenges of operating in a remote corner of the US with harsh winter weather is the pressure on systems from a maintenance perspective. Maj Wright shared his insight: "Anywhere we go [from Eielson], it is a seven-hour flight. Getting people here and getting people home, getting us across the globe on our exercise visits, is a challenge. It requires a lot of logistics, a lot of planning, a lot of co-ordination with the tanker units and our operational support squadron. It helps a lot that we have a tanker base here as well. The 168th Air Refueling Wing of the Alaska ANG is extraordinarily helpful and we have a fantastic relationship with them. They have taken us literally across the globe, from Nellis to Australia.

"In the winter it is a challenge with the systems, but we do keep flying even though it goes 40 or 50 below. We have to undergo Arctic survival training. It is a week-long course where you take what you have strapped to your body and you go out in the woods and survive. They teach you everything you need to know. It is a rigorous course, but it is some of the best training I have ever had. The 66th Training Squadron provides the specialised training where you need to survive for at least 24 to 48 hours when it is 40 below – not easy, especially when you have what the air force

put in your bag for you! Specialty gear is a must during the winter season. We wear four layers of pants and six layers of coats. I am a big dude so it's like shoving a Michelin man in an F-16 cockpit, which is challenging. But during the summer you have 22 hours of sunlight, you can fly whenever you want. The weather is not as horrible as at RAF Lakenheath [in the UK]. If the weather is bad, we have options – we can go into Fairbanks or we can divert to JBER or Anchorage. There is no such thing as bad weather, there is just bad gear and training."

TSgt Miller gave his perspective: "The biggest issues we have up here are the terrain and the weather. It gets really cold sometimes, so radios, radars and some [other] systems do not function as they normally would in temperate conditions. There is a bit of learning on what to do to fix and sometimes [it's a case of] running with it as best as you can. From a maintenance perspective, the mechanical, fuel and hydraulic systems are a challenge to operate in the cold weather. It takes a lot of effort to get the aircraft systems to work appropriately in the wintertime." While environmental factors are the biggest challenge, TSgt Miller pointed to the fact that Eielson benefits from being a relatively small base with one mission on which everyone is focused, unlike at Nellis, for example.



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The future

Pilot attrition is another challenge the 18th AGRS is dealing with. The squadron has some innovative ways to deal with the aircrew shortage. It is part of the Limited Experience Pilot (LEP) programme, in which pilots are absorbed into the unit after their first assignment. They start as wingmen and work their way up as they would in the CAF but tailored to the aggressor qualification course.

Maj Wright commented on the way the aggressors are attracting talent: "The needs of the air force come first. I would rather have my experienced dudes at the front line where they are [most] important. Here at the aggressors, we can train our guys to be just as good as any super-experienced 2,000-hour instructor eventually – it is just a matter of time. We are leaning heavily on the instructor corps and the experienced dudes that we have in the squadron to maintain the standards. The new aggressor pilots might have less experience but that does not translate into us being any less good at what we do. It just means we are learning each sortie and getting better faster. It is a challenge, but it is one we are dealing with well in my opinion."

Echoing this sentiment, Capt Wilson added:



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"Everyone feels the void that is left since we lost the 65th AGRS to budget cuts – we used the F-15C Eagles to mimic *Flanker*-type threats and it is a problem in more recent years where we are flying our ageing F-16 Block 30s, which are less and less capable of replicating more modern threats. We are hoping to get upgrades soon. As far as the future for me, I want to go and fly F-35s. Unless our F-16s get some serious upgrades and more new toys to play with, the F-35 is where I want to be."

Beginning this summer, two squadrons of F-35As will be stood up at Eielson. That is a challenge and an opportunity for the aggressors who will need to support four squadrons of fifth-generation aircraft using one squadron of ageing F-16s. The fifth-generation squadrons at JBER and Eielson will be the primary customers of the 18th AGRS in the years to come. At least one aggressor pilot has completed a final flight in an F-16C and headed to Luke AFB, Arizona, to transition to the F-35A. They will eventually return to Eielson and help establish the new F-35 squadrons. There will be an opportunity for the aggressors to add experienced F-35A crews as augmentees who have already been with the aggressors and know about threat-

replication tactics. The potential to add fifth-generation capabilities to the Red Air portfolio is considerable. TSgt Miller concluded: "From an aggressor perspective it is very good since that gives us a chance to train against two fifth-generation assets on a daily basis. It is good for them to have dedicated aggressor expertise to train with since accurate threat replication is what we do. We already fight with the Raptors from JBER, so we have a pretty good idea of fighting against fifth-generation assets. With the introduction of the F-35 we will need to learn and figure out how to train them properly. As adversaries emerge with advanced airframes with stealth capabilities it becomes harder for us to replicate [using the F-16]. Having fifth-generation aircraft to help us replicate modern adversary airframes will be a huge benefit to us, especially during Red Flags, or MTTs or just our daily missions training against the 3rd Wing Raptors." **AFM**

Acknowledgements

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1: F-16C 86-0304 'AK' performs an afterburner take-off into the Alaskan darkness. This jet, a Block 30D model, was formerly assigned to the 80th FS 'Juvats'. **2:** Another of the BDU splinter jets at Sentry Aloha was F-16C 86-0310 'AK'. This scheme was introduced in 2017 and is similar to the old 'European One' and Southeast Asia camouflage patterns. **3:** Three of the F-16Cs brought to Hawaii for Sentry Aloha display a mixture of the Arctic and blue splinter camouflage schemes on the ramp at Joint Base Pearl Harbor-Hickam. Nearest to the camera is serial 86-0290 'AK/18 AGRS'. **4:** Serial 86-0290 'AK/18 AGRS' is the 'squadron bird', launching here in full afterburner from Joint Base Pearl Harbor-Hickam during Sentry Aloha. **5:** Callsign 'TACT', one of the 18th AGRS pilots, checks over an inert AMRAAM during a pre-flight walkaround at Eielson. The average aggressor pilot has at least 1,000 fighter hours and hundreds of hours of study on the path to becoming a Red Air exponent.

A dirty little war in Mozambique



Despite having total air supremacy, mobility on the ground, excellent communications and access to a range of sophisticated hardware – including drones and some of the best squad weapons on the planet – a sophisticated Russian mercenary force has been driven out of northern Mozambique after only months of mixing it with a tough jihadist force that has Somali roots. It goes much further. A confidential report by a senior United Nations official who has served in Afghanistan, both Sudans, Yemen and

elsewhere, and who has communicated directly with this writer, suggested that by moving into northern Mozambique in force, the so-called Islamic State (IS) is only a step away from becoming fully active in South Africa. He said: “This radical movement already has a strong presence that includes military training bases.” Having entered the conflict at the behest of Russia’s President Putin last October – and enjoying complete dominance in the air with an array of *Hind* helicopter gunships as well as Mi-8/17 *Hip* medium twin-turbine transporters

– the Wagner Group has undertaken numerous actions against an enemy that is entrenched in the rugged jungle and mountain-clad terrain fringing southern Tanzania. That much we know. What we do not is how many guerrilla fighters there are, how they are able to bring their weapons – possibly including man-portable air defence systems (MANPADS) – into the country (likely through Tanzania) and how many foreign fighters there are within their ranks. It’s also not clearly understood how this low-key insurgency managed to escalate into an efficient, elite combat force under the very nose of the Mozambique Army. More to the point, this is the first time in recent years that a group with all the advantages and possible backing of one of the major powers has been driven out of a Third World conflagration by force of arms, despite enjoying complete control of the air.

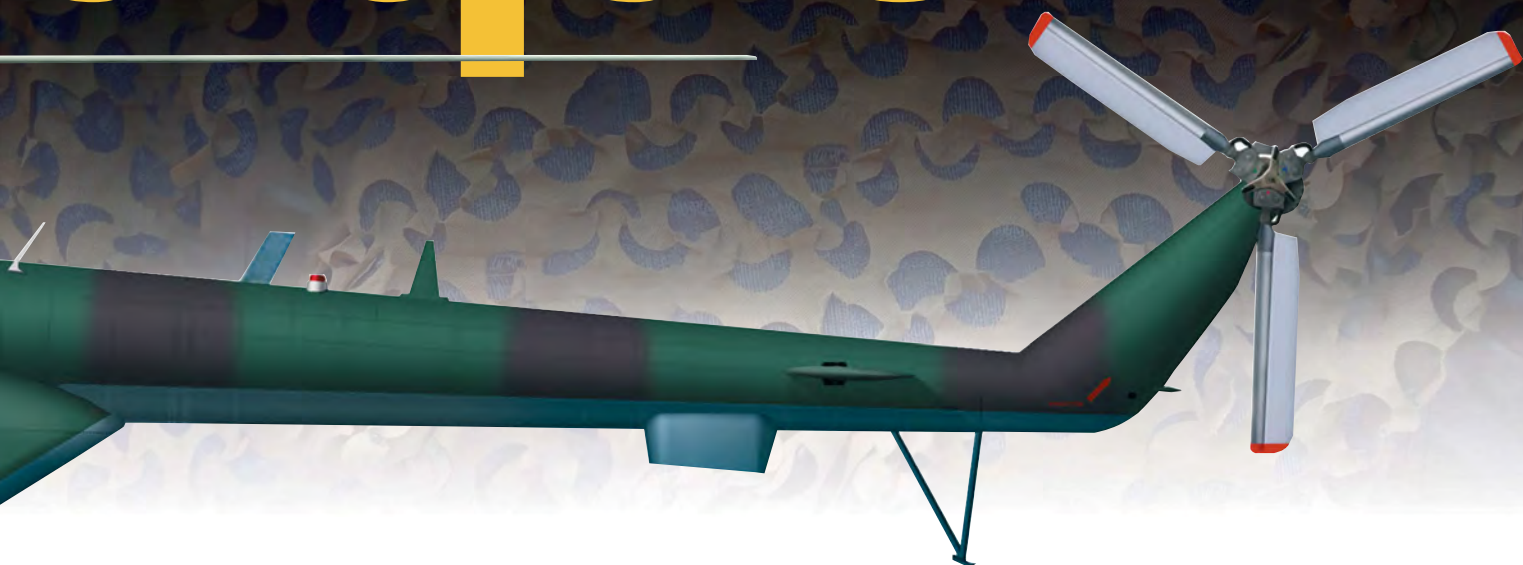
What did emerge in the few months late last year when the Russian mercenary force was active in a vast area adjoining the Tanzanian frontier, is that the latter totally underestimated the ability of a ragged bunch of bush fighters to counter its every move. The jihadi force was better mobilised and a lot better focused than the opposition. Also, it is clear that the jihadists’ intelligence was superior, as every thrust made by the mercenaries and their government allies was met with the kind of hard-line bush tactics that cost lives. Additionally, the region is largely Muslim, with the insurgents enjoying the support – most of it clandestine – of the local population. The truth is that the majority of northerners regard the Forças



A rare view inside a Mozambique Air Force hangar at Maputo reveals examples of the Cessna 172, PA-34 Seneca, FTB.337G Milirole and R40S Festival. Pit Weinert Collection

bique

A guerrilla war in northern Mozambique has seen Russian private military company the Wagner Group tasked with taking the initiative from a committed jihadist force. But it has not gone well, as **Al J Venter** explains.



Armadas de Defesa de Moçambique (FADM, Mozambique Defence Armed Forces) operating in the region – largely staffed by southerners – with suspicion; in some areas populated by the Makonde tribe, the FADM is viewed with downright hostility. Similarly, they have tarred the Russian newcomers with a distinct colonial brush, many of the locals becoming vocal about having ‘foreigners’ subjugate them, as did the Portuguese before the latter were driven out in 1974. By then, Mozambique had been a Portuguese colony for almost five centuries.

A deadly conflict

In the interim there have been quite a few Russians killed. Within a week of arriving in the region early last October, seven Wagner Group mercenaries were killed in two separate incidents involving IS-linked insurgents in Mozambique’s northern Cabo Delgado province. This was followed shortly afterwards with the killing of Wagner Group soldiers in a road ambush in the region’s Macomia district. Five more Russian mercenaries were ambushed on October 27 in the region’s Muidumbe district, a reliable FADM source confirmed. According to several sources in Pemba, the biggest town in the area, four of the Russians were shot dead at the scene of one attack before being beheaded; the fifth was wounded and later died at the local Mueda district hospital. Pjotr Sauer of *The Moscow Times* described the ambush: “The attackers first set up barricades along the road, and when the FADM vehicles arrived, they began firing and then beheaded ▶

Above: A specially prepared artwork of one of the Russian-made Mi-8AMTSh ‘Hips’ (a variant exported as the Mi-171Sh) that were delivered to Mozambique to fight the jihadis in the northern Cabo Delgado region. It is armed with a B-8V pod for S-8K unguided rockets of 80mm calibre. Tom Cooper

Below: A ‘Hip’ that crashed in the embattled north of the country in April last year. The colour scheme of this helicopter seems to match those operated by Russian PMCs, although it is an older Mi-8 model assigned to the Mozambique Air Force. The circumstances of this loss are unclear. All photos Al J Venter Collection unless stated





Above: Although of poor quality, this is among only a few images showing the two former French Army Gazelles in Pemba, capital of the Cabo Delgado province, last August. The two helicopters were reportedly operated by Frontier Services Group (FSG), a private military company headquartered in Hong Kong. **Left:** A Mi-24 gunship – an earlier version of the type deployed by the Wagner Group in Mozambique. A combination of 'Hind' helicopter gunships and 'Hip' medium transporters has ensured the group's aerial dominance, although the situation on the ground has been much more complex.

the victims and burned the vehicle." Significantly, there was helicopter top cover available for these actions, but the dense jungle canopy limited the efficacy of the *Hinds*. Notable too, was the reluctance of the Russian Embassy in Mozambique to respond to a request from Sauer for comment, although the embassy did advise Sputnik, a Russian government news agency, that it had no knowledge of the incidents.

The man believed to be behind the Wagner Group, a strictly mercenary force (although said to include troops from Russia's regular army) is Yevgeny Prigozhin, the former owner of a chain of hotdog stands in St Petersburg who went on to become, allegedly, chef and food taster for President Putin – to check that dishes had not been poisoned; quite a career leap for a man who had served almost a decade in jail for robbery and other offences. It has also been alleged that, under Putin's protection, Prigozhin was awarded a string of lucrative state contracts that apparently went towards bankrolling a private army – the Wagner Group – which has so far seen action in Syria, Libya and more recently, the Central African Republic and Mozambique. With new contracts signed, it will soon also see action against Boko Haram radicals in Nigeria and Cameroon. Uganda is now also a client of the group, which will be active in unsettled areas adjoining Rwanda and the eastern Democratic Republic of the Congo. The origins of the Wagner Group are unclear, although it is thought that it started some years

ago as an organisation called Moran Security, which provides maritime security and other services, and it is claimed that it has since spawned numerous subsidiaries, including the Sewa Security Services, the official bodyguard of the president of the Central African Republic.

Terrorist connections

Mozambique's jihadi insurgency – a bitter, protracted struggle in a totally undeveloped tropical region – has lasted three years so far, with the guerrilla force active in this gas-rich region now known to be linked to IS. Some of its members call themselves al-Shabaab (because of their training in Somalia), although it is known officially as Ahlu Sunna Waljama'a (ASWJ), a name often used by Sunni jihadist groups. There have been numerous similar incidents since late 2017, coinciding with a brutal terror campaign seemingly directed mainly at unarmed civilians. Gruesome photographs of mutilated and beheaded bodies have circulated on social media. The death toll of this insurgency currently stands at about a thousand, with many more injured or displaced. Islamic State has so far claimed responsibility for dozens of the attacks, which raises questions as to whether ASWJ is the local affiliate of IS. The consensus in Pemba is that this jihadist group may be claiming credit to boost its public stature, especially since the fall of its caliphate in Syria and Iraq.

As ASWJ began to make its mark, the struggle escalated sporadically, most victims being local

tribal people, the majority non-Muslims. The FADM was unable to cope, and the Maputo government asked Moscow for help, with promises of rich gas concessions in the region as recompense. It was then that Putin tasked the Wagner Group – or what the *Times* has called 'Putin's private army' – with the job.

Roughly 200 Russian private military contractors – backed by several *Hind* helicopter gunships as well as a number of Mi-171Sh aircraft (which have the same performance as the Mi-8MTV, but with more sophisticated systems fitted) – first started operating along the Tanzanian frontier, and only later moved into the interior of the Cabo Delgado province. Air and ground forces were designated to operate in close co-operation with the FADM. During initial ground and air strikes, the combined forces bombed insurgent bases in several areas, pushing them into the remote interior, but the insurgents retaliated by launching attacks on several government military bases and dozens on both sides were killed. Following the arrival of the Russians, IS quickly reinforced its units in Mozambique by rushing in 'volunteers' from other East African countries, notably Somalia; this soon led to an intensified series of guerrilla onslaughts. As one observer commented: "The presence of Wagner created an exponential increase in incidents – it was as if someone had kicked the hornet's nest."

By mid-November last year, several sources in Mozambique and South Africa observed





Above: In a scene demonstrating Russian and Western interests in Mozambique, an RAF A400M Atlas C1 shares the ramp at Beira International Airport with a pair of Russian An-12 transports. The RAF airlifter was delivering 20 tonnes of aid supplies after a devastating cyclone in March last year. Crown Copyright

growing tensions between the Wagner Group and the FADM after a number of failed military operations. Joint bush patrols were halted, and it was reported in Pemba, Nacala and other northern cities that there had apparently been a breakdown in trust between Moscow's men and the FADM. It is no longer a secret that the Wagner Group regards Mozambique's military not only as inadequate, but badly trained, inefficient and unmotivated. "They are simply not up to the task at hand," said one observer who has spent time in the region. Part of the problem that only emerged recently was that many Mozambican soldiers had experienced problems being paid. The money had been dispatched northwards from Maputo, but it often seemed to go into the pockets of their officers; stuck in an isolated corner of the country 1,000 miles from the capital compounded the matter still further. Shortly afterwards, the entire Wagner Group contingent – together with all its air assets – pulled out of northern Mozambique and returned to its regional headquarters at Nacala, a large air base north of Beira, where the force had originally landed. This was followed by a security blanket dragged over the entire area by the country's state security forces, the Forças de Defesa e Segurança (FDS).

Journalists covering the story who try to enter the area are often arrested. It is not only Mozambique's security forces that are a threat to anybody getting too close to the

Russian operatives. Three Moscow journalists were murdered in the Central African Republic while undertaking investigative research into the mercenary group's Kremlin links in August 2018. Kirill Radchenko, Alexander Rastorguyev and Orkhan Dzhemal were warned by friends to desist from continuing with their inquiry. When they did not, they were killed by unknown assailants.

Nacala, the mercenary force's headquarters in Mozambique, is the biggest city in the north and while still operational, the Russians were dispersed to three military barracks, namely Macomia and Mueda in Cabo Delgado province, and the command group in the southern Nampula province. According to John Gartner, a former Rhodesian special forces operative and head of OAM International – a private military company (PMC) that originally tendered for the security contract, but lost out to the Wagner Group – Mozambique's military was not the only participant at fault; the Russians were also totally "out of their depth" in fighting jihadis, "despite being completely air dominant", he told a colleague.

Local challenges

Earlier, after the Wagner Group had arrived in East Africa, veteran African mercenary aviator Neall Ellis told the author that he doubted whether the Russians would be able to cope in Mozambique's harsh environment, in which flying is often beset by weather, bad communications

and a lack of basics like fuel, which has to be brought in overland across a region where ambushes are commonplace. The Russian force arrived with a lot of advanced military equipment that included helicopters, drones and infantry fighting vehicles, but obviously knew little of actual conditions in the field, Ellis said. The terrain in northern Mozambique presented a new set of problems, he added: "It's a totally different kind of warfare to what they've experienced in Syria or Libya." Ellis' immediate perception was that the group's commanders had done very little groundwork: "The Rovuma [river] may as well have been a new brand of toothpaste."

The main problem facing the mercenary force was that it was totally unfamiliar with what became a series of tough encounters against an enemy thoroughly familiar with conditions 'in its own backyard'. Most contacts followed ambushes laid by the insurgents in culverts or approaches to water crossings, the route taken by the Wagner Group's soldiers having been monitored from one of thousands of granite high points scattered throughout the region. Furthermore, the group's patrols could face lions and leopards on night patrols on land and a multitude of crocodiles and hippos in every river and stream, encounters with both of which result in fatalities for those ignoring basic bush-orientated disciplines.

Sources indicate that the mercenaries were equipped with an array of good East European and Chinese weapons, the majority 'fresh out



Above: A gathering of Wagner Group combatants. The origins of this mercenary force are obscure, but it's thought to be headed up by Yevgeny Prigozhin, a close associate of President Putin. Left: Images of Russian-operated helicopters serving in Mozambique are hard to come by. This Russian Mi-8T, registration RA-06114, was operating in the Central African Republic.



Reloading the 80mm calibre B-8 rocket pods on a Mi-24. The Wagner Group mercenaries have been provided with high-quality weapons from Chinese and East European production, as well as radio communication equipment.

of the box, as well as radio communication equipment. Also, they know how to make good use of it all. More salient, Ellis suggested, they were unlikely to get on with local folk, a largely Muslim community with a history of antagonism towards foreigners that goes back centuries. "The belligerent Makonde tribe, in particular, would regard this alien bunch of 'infidels' arriving on their patch as a rude intrusion," he declared, adding that the Makonde people (spread out on both sides of the Rovuma) gave the Portuguese Army a lot of grief when they still ruled. As for air cover, Ellis declared after the Wagner Group combatants had pulled back to Nacala: "The impression I got from some of my people who were on the ground there, was that Wagner operatives displayed little understanding how such things operate in that part of Africa." For instance, the journey from Pemba, the oil and gas port on the coast (to the immediate east of the area where much of the fighting has taken place) to the Lugenda River, a tributary of the Rovuma which forms the border with Tanzania, a distance of roughly 217 miles (350km), can

take ten to 12 hours in an SUV in the dry season and twice that when it is wet. Ellis added that as the IS insurgents were Muslim, it was not difficult to imagine where the sympathies of the local population would lie. "And that," he explained, "puts paid to any reliable intelligence likely to emerge from the jungle interior."

It is also notable that tens of thousands of people of the Islamic faith have emigrated into the region from Tanzania in recent years, a community that would clearly be opposed to any kind of "foreign military intrusion", as it was described by local news agency Carta de Moçambique. With almost no frontier controls, the insurgents are able to count on further support from friendly elements who can easily infiltrate southwards across unpatrolled rivers in small boats and pirogues. The country's vast shoreline is equally vulnerable; the navy arm of the FADM rarely patrols a coastline that extends southwards more than 1,490 miles (2,400km) from the Tanzanian border.

There are several other reasons why the Wagner Group was forced to pull back to Nacala. While the move may not be permanent

and could represent a pause for a simple reassessment of the situation before heading back into action (although satellite images suggest that all its helicopters have returned there), it did not come as a complete surprise. Earlier, the mercenary leadership had given the Maputo government notice that conditions in the north were "unsustainable", although a reliable South African source indicated that there had been serious differences between the Wagner Group's command structure and the FADM in the region. As a consequence, OAM International, the Dubai-based PMC that originally tendered for the security contract, resubmitted its application to Maputo in December.

Interestingly, both the Mozambique government and the Russians have been unusually secretive about the Wagner Group's role. For instance, while nobody could miss what the group has been doing, Maputo's defence ministry has declared that it knows nothing about the matter. Contacted by Carta de Moçambique, the ministry's spokesperson, Custódio Massingue, said it was a "novelty" to hear that the country had received Russian military support. Despite the enormous shipments of weapons and helicopters that had arrived in Nacala by sea and air.

Secretive Gazelles

Neither the Wagner Group nor OAM International are the first to have attempted to aid Mozambique in its fight against insurgents. Among those previously known to have been involved are Cape Town resident Lionel Dyke, who has been operating a PMC for several years, as well as Erik Prince, the American founder/owner of the now defunct Blackwater Group (of Iraq notoriety). One of Prince's companies, Frontier Services Group (FSG), chartered two unmarked Gazelle helicopters painted in military camouflage last August, both of which were subsequently spotted in Pemba, capital of the Cabo Delgado province. They were supplied from South Africa on a three-month trial basis by Durban-based Umbra Aviation. Having been supplanted by the Russians, Prince withdrew the helicopters in mid-September 2019.

It is interesting to note that Prince's Dubai-

Right: This giant Russian An-124 transport arrived at Nacala last September, apparently carrying Wagner combatants and their equipment, which included helicopter gunships.



From around 17 examples of the 'Hip' delivered to the Mozambique Air Force - including a Mi-8P in 1980 followed by eight Mi-8TVs from 1983 to 1987 - just two remain in service today. Pit Weinert Collection





At least two Mozambique Air Force An-26Bs were overhauled and refurbished in Kiev during 2013. Delivery of one, 1981-built example, took place in early January 2014, although it crash-landed after an engine failure during take-off in February 2015. One example remains in use at Maputo. Pit Weinert Collection

based Lancaster Six Group (L6G) private security firm had initially been in competition with the Wagner Group and Eeben Barlow's South African Specialised Tasks, Training, Equipment and Protection International (STTEPI) for security contracts in Cabo Delgado. Prince promised to eliminate the terrorists in three months in return for a share of oil and natural gas revenues. Since then, AFM has acquired details allegedly linked to the submission made by OAM International that would see the involvement of ground as well as air elements in northern Mozambique should the Wagner Group withdraw. Comprising a comprehensive 12-page document, the proposal covers both ground and air operations envisioned to neutralise what is recognised as an efficient and highly motivated Islamic force. The 12-month contract, worth US\$35.4m, would involve a total ground and air force incorporating 166 combat personnel, of whom 100 would be selected Mozambican military qualified personnel. The main focus would be on what is termed a tactical air and ground assault unit (TGAU) with the ability to perform such operations. Other details include what are termed "required capabilities". These are:

- Specialised ground combat troops capable of operating day or night and in any weather deep inside enemy territory
- The use of fixed-wing aircraft for reconnaissance, interdiction and close

air support to ground forces

- The use of helicopters for day/night all-weather deployment and recovery of ground forces, as well as the recovery of any operational casualties
- Target acquisition, identification and destruction using ground and air assets
- Combined air and ground operations with other government forces
- The ability to transport ground forces without detection into and out of mission areas
- The collection, assimilation and dissemination of operational intelligence when and where required.

The headquarters element is detailed as a "mobile organisation and will deploy to wherever the tactical situation requires offensive operations against the enemy". Similarly, the aviation element "must be able to simultaneously deploy four teams consisting of 12 fully armed combat soldiers with aerial assets for a radius of action of 125 miles (200km) from the base of operations".

The unit's aviation element requirements are as follows:

- 1 x An-72 or An-26 transport aircraft for the transport of personnel, equipment and parachuting of men and equipment
- 1 x light aircraft (PC-6 Porter) for reconnaissance, 'sky shout' and medevac support
- 4 x MD 600N or similar light gunship helicopters for fire support and medical evacuation
- 4 x Mi-171 or UH-1 transport helicopters for the deployment of ground forces and equipment

- Qualified and operational air and ground crews in order to accomplish the required tasks.

Following the Wagner Group's losses in Mozambique (and failure to complete the anti-insurgency tasks it faced against a basic, ill-equipped guerrilla force) the word is out in Africa that the Russians are not quite the formidable combat force they like to promulgate. Consequently, some of the contracts on the table at present – Cameroon and Uganda especially – are likely to be reviewed, the former specifically, as France is powerfully opposed to a Russian military presence in one of its ex-colonies with which it maintains strong historical ties.

The most serious immediate consequence of the insurgency is that, for the first time, an enormous series of oil projects focused on the 'gas city' of Afungi in Cabo Delgado – the largest single investment on the continent – are threatened by a disparate collection of jihadists. America's ExxonMobil and France's Total met in Paris last November (with French intelligence apparently also in the picture) to discuss security plans to protect their investments. They could not find common ground to proceed. Already, ExxonMobil has put its \$US30bn natural gas project on hold, and with a seemingly impotent FADM, and the guerrillas gaining ground by the week, it doesn't seem likely to take off. Waiting in the wings are several private military companies ready to move in at short notice. But that costs money and the Maputo government is reluctant to fit the bill. **AFM**



When it comes to the prowess of their delta-wing jets, the mantra of 331 Mira pilots is that 'One way to respect the Mirage 2000-5 is to fly it; the other way is to fly against it.' An autopilot derived from the Airbus A330 series takes control of the flight profile when pilot workload becomes an issue. All photos Ioannis Lekkas unless stated

Greek Mirage 2000s

The Hellenic Air Force initially ordered 36 single-seat Mirage 2000EGs (serial numbers 210 to 245) and four two-seat Mirage 2000DGs (serials 201 to 204) to supplement its Mirage F1s. Greek Mirage 2000s are unusual in that they are armed with the AM.39 Exocet anti-ship missile. They are also equipped with an internal, fully integrated self-defence suite known as the ICMS Mk1 (Integrated Counter Measures System Mk1), with another pair of super-heterodyne antennas on the fin-top, additional wing tip antennas and Spirale chaff/flare dispensers in the rear of the Karman fairings.

The ICMS Mk1 jammer is capable of both noise and deception jamming techniques and its response time is extremely short. HAF Mirage 2000s were divided between

331 and 332 Mira, both based at Tanagra.

To bolster its offensive capabilities, the HAF decided to order a further 15 new-build Mirage 2000-5 Mk2s and upgrade ten of its earlier aircraft to the same standard. The 2000-5 Mk2 variant is very close to the 2000-9 and Greece received SCALP cruise missiles for its new aircraft, thus creating a very potent conventional deterrence force. The HAF Mirage 2000-5 Mk2s are equipped with NATO-compatible SATURN (Second-generation Anti-jam Tactical UHF Radio for NATO) frequency-hopping encrypted radios and the ICMS Mk3 self-defence suite. The HAF 'Dash 5s' are designated Mirage 2000-5EG (single-seat) and Mirage 2000-5BG (two-seat).

Theseus over the Aegean

*Introduction of the Mirage 2000-5 Mk2 by the Hellenic Air Force brought 331 Mira into a new era. The type has since evolved into one of the most important deterrents in the armed forces' inventory, as **Ioannis Lekkas** discovers.*



It is now more than ten years since 331 Mira (331 Squadron) 'Theseus' attained operational readiness with the Mirage 2000-5 Mk2, and the unit has reached a level of maturity. It has accumulated valuable experience in the air superiority role, both as a result of the part it plays in everyday efforts to preserve Greece's security and its participation in major national and international exercises. With a recent increase in Turkish 'provocations', Elliniki Polemiki Aeroporia (Hellenic Air Force, HAF) pilots voice their enthusiasm for the delta-wing Mirage. With no margin for error, the unit's pilots and ground crew train continuously, with realistic scenarios to counter potential threats from the east.

One of the primary tasks for the squadron's leadership is to mentor newly arrived pilots with a view to undertaking quick reaction alert (QRA) missions as soon as possible. The physical and mental demands are considerable,

but the recruits are rewarded ultimately with their first real scramble to face enemy fighters. A cool head and iron self-discipline are required in peacetime operations, given that each Mirage carries six live air-to-air missiles (AAMs) and dozens of 30mm cannon rounds to dissuade enemy fighters from staking a claim on Greek airspace in what has become, to all intents and purposes, a 21st-century Cold War.

Flight crews undertaking QRA duties are briefed alongside the Ethnikó Kéntro Aeroporikoú Elénchou (National Air Control Centre) and the ground control interception (GCI) staff, to establish every aspect of their mission. Once airborne after a scramble, the formation falls under the control of the GCI controller, but it's up to the flight leader to determine how the interception will be executed and what tactics will be employed if the intruders indicate a willingness to enter into a within-visual-range (WVR) confrontation. Peacetime rules of engagement (ROE) require the visual identification (VID) of any 'bandits', so a merge of opponents is often unavoidable, resulting in a fierce dogfight. In a real-world conflict, however, without peacetime restrictions and having obtained official confirmation that an intruder was hostile, the Mirage pilot would launch his MICA missiles from beyond visual range (BVR), taking advantage of the full capabilities of the RDY-2 multifunction fire-control radar.

'Dash 5' in detail

The most modern version of the Mirage 2000 in HAF service incorporates a number of assets that make it one of the most effective fighters in the region. The most significant of these is the RDY-2 radar integrated with the ICMS Mk3 electronic warfare suite. The radar is capable of acquiring targets at a range of about 100 miles (160km), 24 of which may be represented on the head-level display (HLD). The suite evaluates the eight potentially most lethal threats – target prioritisation – enabling the pilot to release four BVR missiles simultaneously.

For air combat, the radar's basic operation is track-while-scan (TWS), exploited in two modes: auto and manual. In the latter, the RDY-2 searches the area for targets and, after revealing 24 track files, prioritises the eight most threatening. The pilot then switches to TWS auto and selects which targets will be locked on to for missile release. Four infrared-guided MICA IRs or radar-guided MICA EMs can be released simultaneously.

The MICA IR incorporates a valuable 'silent' BVR feature. Active radar missiles require continuous illumination by their own seeker after they become active (known as 'Pitbull') until impact, and thus continue to give warning to the target that it has been fired upon. When launched in BVR mode, the MICA IR leaves the rail with exactly the same parameters as



A key advantage of the Mirage 2000-5 Mk2 is its MICA IR missile, which can be effectively employed for both close-range encounters and BVR engagements. From the moment the MICA IR becomes 'Pitbull' and engages its own infrared seeker, the target aircraft typically has no warning of the missile's approach.

an active radar missile, with initial guidance provided via data link, and the Mirage's RDY-2 giving full warning on the target's radar warning receiver (RWR) equipment. However, it becomes fully passive after the Mirage's radar stops supporting the launch and the missile now relies on its own (passive) infrared seeker. Consequently, the target's RWR stops warning of the missile threat unless the target carries a missile approach warning system (MAWS). This feature, enhanced by a data link, enables a Mirage 2000 formation to face numerically superior forces – an invaluable asset in the combat air patrol (CAP) role over the Aegean.

Defensive countermeasures

Also of great value is the radar's interoperability with the ICMS Mk3 integrated countermeasures self-protection suite, which can be operated in two modes. When operating autonomously, the smart mode jams simultaneously with radar function and a computer selects the method of electronic attack. Back-up mode may be used when the pilot selects either radar or electronic warfare (EW). The central computer receives data from the radar and the ICMS to calculate the appropriate attack parameters. Before each mission, Dash 5 pilots are able to upload specific data as briefed using the OPERA mission-planning system.

Armed with six BVR missiles, the Mirage 2000-5 Mk2 has become a potent symbol of air superiority in the Aegean operational theatre. In particular, the fact that the MICA IR gives no warning when it goes 'Pitbull' is thought to be a major concern for the Turkish Air Force leadership.

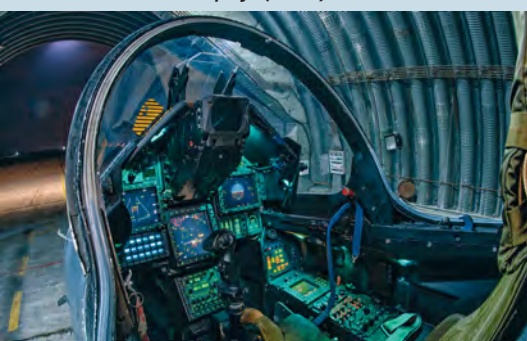
Another key feature of the Dash 5 is its enhanced man/machine interface, incorporating five displays – four multifunction displays (MFDs) and the head-up display (HUD) – available to the pilot. On the lower, larger MFD 55 display (also known as the Tactical Situation Display) all tactical information



Above: The Mirage 2000-5 Mk2 is an excellent BVR platform able to engage from distance thanks to superior radar and missiles. Merging with a rival jet is not the pilot's first priority and is normally avoided. Pictured are Mirage 2000-5EG serials 535 and 536, both wearing the blue-and-white chequerboard fin flashes of 331 Mira. Left: HAF Mirage 2000 pilots appreciate the jet's crisp flying characteristics and highly intuitive navigation aids. Their first encounters with rival jets over the Aegean should serve to expand their confidence as they have a chance to evaluate 'the enemy' at firsthand.



Above: A 'Theseus' weapons specialist checks over a Mirage on night QRA duty. 331 Mira maintains a QRA alert responsibility around the clock. From the very first operational deployment in the late 1980s up to the introduction of the 'Dash 5', QRA duties have always been the main concern of Greek Mirage 2000 crews. **Below:** The cockpit of the Mirage 2000-5 Mk2 incorporates a pilot-friendly human-machine interface suite that allows the crew to monitor only the desired parameters in terms of flight or combat conditions. A head-level display (HLD) is provided along with three multifunction displays (MFDs).



Above right: View from the cockpit of a Mirage 2000-5 Mk2. Attending courses offered by the HAF's Fighter Weapons School at Andravida, 331 Mira aircrew build confidence in air-to-air engagements as they participate in composite air operations with other Greek squadrons and practice dissimilar air combat training. **Below:** A training scramble for Mirage 2000-5EG serial 549 as its afterburner lights up on the Tanagra runway. They take off fully armed in all weather, day or night, 365 days of the year.



'Theseus' leader

Lt Col Christos Kontses, the 331 Mira commanding officer, spoke to *AFM* about the squadron's mission.

"Since April 1988, 331 Mira has been on the front line of operations for the Hellenic Air Force. Throughout these years, the squadron's pilots and ground personnel have proved their high sense of responsibility and have made every possible effort to succeed in the tough task assigned to them by the country's leadership. Over three decades of flight operations, the squadron has completed tens of thousands of flight hours and taken part in at least five operations in the defence of national airspace, flying from Tanagra, Skyros, Heraklion, Santorini and Kasteli.

"Proof of the international admiration the squadron enjoys may be found in its NATO Reaction Force [NRF] evaluation in 2009, when it was graded as 'Exceptional'. Furthermore,

331 Mira excelled in the Tactical Leadership Programme courses in 2013 and 2018, acquiring first place in both; 'Theseus' pilots were awarded the Best Warriors trophy, while all participants stated that, in an operational situation, 331 Mira would be the best unit to have by their side.

"However, the squadron's real accomplishment is not found in its operational presence nor in its daily operations. The great feat is that the squadron has an individuality and a certain focus. Personnel live for their work, collaboration and teamwork regardless of rank and position, having fully acknowledged the significance of their mission. After three decades, 331 Mira's men and women are ready and more willing than ever to accomplish their mission - to defend the values of the homeland."



331 Mira

is shown, including targets and threats (both aerial and ground), warnings, jamming information and fighter area of responsibility (FAOR) boundaries, plus navigation waypoints. For the long-range attack mission, the release point for the SCALP EG cruise missile is displayed on an MFD. According to Dash 5 pilots, the information that can be displayed is limitless, so extensive training is needed to derive maximum benefit from the system. The pilot usually selects an MFD 54 (the two smaller displays left and right of the larger MFD 55) to present flight data and engine and stores information. Additional EW information is displayed on the right-hand MFD, in addition to that shown on the lower display. The fourth display incorporates the HLD suite, dedicated to the radar equipment, which discloses all track files and on which BVR missile releases may be managed. Uniquely, it is not mounted level and gives the impression of depth, while being focused to infinity so the pilot is able to glance into it quickly without needing to refocus their eyes in the ongoing air battle. One 331 Mira pilot told AFM that they use the HLD as a fundamental

Right: If the situation demands it, 331 Mira pilots will not avoid a dogfight and the French fighter remains one of the most manoeuvrable jets around. Traditionally the centre of Greek interception duties, Tanagra gives Mirage 2000 pilots the chance to experience real-life scrambles from the beginning of their operational careers. **Below:** Final checks in the cockpit before Mirage 2000-5EG serial 555 taxis out for its next sortie. The time from shelter to taxi is low – typically half that of comparable US-built fighters, according to the HAF.



Below: A Mirage 2000-5 Mk2 fully loaded with six AAMs (four MICA EM and two MICA IR) plus a SCALP EG. With the exception of SCALP and Exocet missile release, HAF Mirage 2000 doctrine doesn't anticipate air-to-ground operations. When undertaking a long-range attack, the jet remains fully capable of air-to-air combat. **Right:** James Lawrence



air combat tool, including support of 'Fox Three' (active radar-guided missile) launches.

The Dash 5's comprehensive MFD suite is fully compatible with night-vision aids and has proven to be an indispensable asset of the delta fighter. As well as tracking radar returns, the HLD displays the location of the formation members, enhancing the pilot's situational awareness without distracting their attention from the battle; this is known as precise participant location and identification (PPLI). The Mirages' locations are provided via the Improved Data Modem (IDM), a data link that connects all jets of the same type. For example, a formation of four Dash 5s can exchange information without using voice communications over a range of more than 400 miles (644km).

Cruise missile operations

A critical role assigned to 331 Mira is long-range attacks employing the SCALP EG strategic cruise missile, acquired largely as a powerful deterrent in case of a significant crisis. The missile's 992lb (450kg) BROACH warhead is capable of destroying high-value assets such as energy production units, bridges, communication centres or heavily defended control and command centres. The official range of the weapon is 155 miles (250km), well within the 186-mile (300km) limit set by the multilateral

Missile Technology Control Regime (MTCR), although its real range is estimated to be beyond 373 miles (600km). The SCALP EG's Microturbo TRI 60 turbojet engine gives a top speed of Mach 0.8, while navigation to the target is achieved via a combination of an inertial navigation system (INS), GPS and terrain profile-matching (TERPROM), leaving the imaging infrared seeker for the terminal guidance.

Carrying the SCALP EG does not constrain the type's air-to-air capability, which remains six missiles plus external fuel tanks. A priority for 331 Mira's leadership is training all pilots to be fully SCALP-EG-capable. **AFM**



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085/20

Previously unreported MQ-9A crash - report released

US AIR COMBAT Command recently released an Abbreviated Accident Investigation Board (AAIB) report into a previously unknown accident involving a USAF Reaper. The report, released on January 16, reveals that, on June 27, 2018 at about 1823hrs Zulu Time, the mishap aircraft (MA), an MQ-9A, serial 12-4201, impacted the ground short of the runway at an unspecified location in the United States Central Command Area of Responsibility (US CENTCOM AOR). Assigned to the 432nd Wing, Creech Air Force Base, Nevada, the MA was operated by the 62nd Expeditionary Attack Squadron Launch and Recovery Element in the deployed environment at the time of the mishap. The aircraft was destroyed, and the loss of government property was valued at US\$11,848,814. There were no injuries or fatalities and no reported damage to civilian property.

Approximately 20 minutes after a successful launch, the mishap crew (MC) discovered an oil level and pressure warning; the oil was at 76% and dropping rapidly. The MC declared an

inflight emergency, notified the Mishap Mission Safety Observer (MMSO) and turned the MA back towards the airfield. The mishap pilot (MP) declared his intention to move the MA to a position above the airfield (high key) which would provide him more time to assess the situation and more opportunities to land the aircraft.

Once the MMSO arrived in the Ground Control Station (GCS), he assessed the situation and recommended the MP not to go for high key, but rather to head straight to the field for a straight-in approach. This approach is a quicker option to land the aircraft, but the pilot has only one opportunity to touch down. The MP altered course to head for the straight-in, reasoning a high key approach may result in loss of life if he lost link with the MA.

About 10nm from the airfield, the MA experienced un-commanded high torque, making it difficult for the MC to slow the drone. The mishap pilot subsequently shut down the engine. As the MA approached the runway, the mishap crew assessed the drone's altitude to be too high and its energy too fast for a successful landing. Therefore, the pilot, at

the direction of the MMSO, took two corrective actions: first, he slipped the aircraft, reducing its altitude; second, he activated the Reaper's flaps to slow it down. The mishap aircraft slowed, stalled and crashed just short of the runway, within the fence line. The aircraft caught fire on impact and was destroyed.

The president of the AAIB found, by a preponderance of the evidence, the cause of the mishap was the MC's deviation from preferred simulated flame-out (SFO) emergency procedures following an oil leak.

When crews experience an SFO, the normal course of action is to get to an overhead approach, such as high key, to provide maximum altitude and time to assess the emergency. Initially, the inexperienced MP properly assessed the in-flight emergency by attempting to return to the airfield to make a course for high key. However, the pilot deviated from the preferred SFO procedures when he diverted to a straight-in approach. The MP stated he changed course due to his focus on *potential* loss of life that could result from *potential* loss of link with the MA. The report

concluded there did not appear to be evidence to indicate loss of link concerns from a high key position. Two subsequent decisions led to the crash. First, the MP prematurely shut down the engine, increasing the difficulty for a straight-in approach. Second, the MP calculated the MA's altitude and speed to be too high and too fast.

In addition, after examining the evidence, the AAIB president determined that the pilot's lack of assertiveness was a substantially contributing factor in the mishap. In reviewing the totality of the evidence, the MP allowed the more experienced MMSO to take over flight decisions. The principal decision to deviate from getting to high key took the MP outside of the level of training he received prior to the mishap. By taking himself out of his comfort zone, the MP's lack of assertiveness took root in the GCS. The lack of assertiveness allowed for crew resource management (CRM) to break down and the halo effect to grab hold, resulting in the MP acquiescing to the MMSO's suggestions, even though the mishap pilot was not skilled enough to complete the MMSO's more advanced manoeuvres.



Above: A USAF/432nd Wing MQ-9A flies a training mission over the Nevada Test and Training Range, last January 14. An accident report into another of the unit's Reapers, serial 12-4201, which was lost in a crash in the CENTCOM AOR on June 27, 2018, has recently been released. USAF/Airman 1st Class William Rio Rosado

Accident Reports

D: Mar 21, 2019
N: US Air Force/Oregon Air National Guard/173rd Fighter Wing/114th Fighter Squadron
T: F-15C Eagle

A previously unreported incident occurred during 1-v-1 basic fighter manoeuvring training with another F-15C at an altitude of approximately 18,000ft (5,500m) over Oregon. The student pilot put the aircraft into a turn, during which he experienced G-forces which caused him to pass out. He regained consciousness 11 seconds later, put the engines to idle and pulled back on the stick to begin recovery of the aircraft. However, the 12.4g recovery manoeuvre overstressed the airframe, causing serious structural damage to the wings, tail and fuselage. The F-15C landed safely back at Kingsley Field, Klamath Falls International Airport, Oregon, without injury to the pilot. The cost of repair is estimated to be in excess of US\$2.5m and as of last January the fate of the airframe was undecided.

D: Apr 2, 2019
N/U: US Air Force/352nd Special Operations Wing/7th Special Operations Squadron
T: CV-22B Osprey

While flying over Belgium, this aircraft was struck by lightning but made a safe emergency landing. There were no injuries to the crew reported, but the Osprey sustained damage to one of the tiltrotor blades and the incident was categorised as a Class A mishap, indicating more than US\$2m damage.

D: Apr 10, 2019
N/U: US Air Force/3rd Wing
T: F-22A Raptor

This aircraft experienced an engine stall in flight, resulting in it shutting down. The pilot returned the fighter safely to base and was not injured, but the Raptor sustained more than US\$2m damage – categorised as a Class A mishap. The aircraft is based at Joint Base Elmendorf-Richardson, Alaska, although it was not reported whether this was the location of the incident.

D: Apr 10, 2019
N/U: US Air Force/1st Fighter Wing



Above: Peruvian Air Force L-100-20 Hercules serial 397 following a nose undercarriage collapse while under tow at Santiago de Chile Airport last December 28. *Informes de Emergencias Chile*

T: F-22A Raptor
 The Raptor ingested unspecified material in flight, causing engine damage. The pilot returned the aircraft safely to base and was not injured, but the jet sustained more than US\$2m damage – categorised as a Class A mishap. The unit is based at Joint Base Langley-Eustis, Virginia, but it was not specified whether the F-22A was operating from there at the time.

D: May 21, 2019
N: US Air Force/Air Force Materiel Command
T: Unspecified UAV

Officials have recently revealed basic details of the previously unreported loss of this UAV,

which crashed shortly after take-off at an unspecified location while being operated by Air Force Materiel Command. Although the USAF would not identify the type, officials say it was a Group 4 class UAV, with a weight of approximately 1,320lb (600kg). UAVs in this class include the US Navy MQ-8B Fire Scout and US Army MQ-1C Gray Eagle, but in view of the reluctance of officials to identify the type, it is likely that it was a new model under test.

D: Sep 24, 2019
N: US Air Force
T: B-1B Lancer

A previously unreported ground incident with this aircraft took

place while it was undergoing maintenance at Tinker Air Force Base, Oklahoma. An abnormal restart of one of its engines caused destruction of an engine bearing. This resulted in the aircraft having to be taken out of service for a longer period of time while the engine and damaged components were replaced. Because of the high cost of repair, it was categorised as a Class A accident, indicating more than US\$2m damage.

D: Sep 26, 2019
N/U: US Army/C Company/1st Battalion/5th Aviation Regiment
T: UH-60L Black Hawk

S: 05-27063

Adding to the previous report of this Black Hawk crash (see *Attrition*, November 2019, p89), the serial of the helicopter involved is now known, as given above, also confirming the variant as a UH-60L. It is confirmed as a write-off.

D: Oct 11, 2019
N: Ethiopian Air Force
T: Su-27UBK
S: 1901 (c/n 96310425064)

Adding to the previous report of this *Flanker* crash (see *Attrition*, December 2019, p88), the serial number is now known, as given above. At the time of the crash, the aircraft was about to carry out an air display practice for a graduation ceremony on October 15.

D: Dec 15, 2019
N: Turkish Armed Forces
T: Bayraktar TB2

During a Libyan National Air Force air strike on Misrata air base,



Above: The wreckage of US Army MQ-1C Gray Eagle serial 02188 following its crash in Niger on February 29.

Abbreviations: **D:** Date **N/U:** Nationality/Units **T:** Type **S:** Serials

The Myanmar Air Force Mi-17 following a heavy emergency landing on March 6 in northern Shan state.



Libya, using Blue Arrow 7 air-to-surface missiles launched from Wing Loong II armed UAVs, four hangars used by Turkish Bayraktar armed drones were destroyed. At least one of these UAVs, along with a large cache of weapons for them, were destroyed.

D: Dec 28, 2019
N: Peruvian Air Force/Grupo Aéreo 8/Escuadrón Aéreo 843
T: L-100-20 Hercules
S: 397

At approximately 1610hrs Peruvian time, while being towed across the apron at Santiago de Chile-Comodoro Arturo Merino Benítez International Airport, prior to engine start, there was an incident which resulted in unspecified damage to the nose undercarriage when it collapsed. As a result, a Peruvian Air Force C-27J was dispatched with equipment and personnel to repair the damage and enable the aircraft to continue its journey. The Hercules was en route to Punta Arenas and onwards to Eduardo Frei base in Antarctica, carrying a Peruvian Air Force Bell 212, nine crew members, 31 scientists and two journalists. None of those on board were injured and they remained at the airport while awaiting repairs to the aircraft.

D: Jan 25, 2020

N/U: US Navy/HSC-12
T: MH-60S Seahawk
S: 167835 'NF-612'/'01'

Adding to the previous report on the loss of this helicopter (see *Attrition*, March, p109), the example involved has now been identified.

D: Jan 27
N/U: French Air Force/EIVV 05/312
T: Schempp-Hirth Duo Discus
S: 434 'CVA' ?

This glider was written off when it crashed at 1615hrs local time in an open area near Base Aérienne 701 Salon-de-Provence after the pilot radioed the base saying there had been a technical failure of the air brakes during a routine training flight. Both the instructor and student were injured, one of them suffering facial injuries and being taken to hospital by helicopter for treatment.

D: Feb 27
N/U: Spanish Air Force/Academia General del Aire/Ala 79/794 Escuadrón/Patrulla Águila
T: C-101EB Aviojet
S: E.25-63 '74-17'/'5'

Adding to our previous report on the crash of this aircraft (*Attrition*, April, p89), the above serial has been reported as the correct identity for this loss, rather than E.25-65 '79-95'/'5'.

D: Feb 28
N: Chinese People's Liberation Army Air Force
T: JH-7A

This strike aircraft crashed on an urban road in Tianjing, reportedly killing the pilot, although it's unknown whether there were any casualties on the ground.

D: Feb 29
N: US Army
T: MQ-1C Gray Eagle
S: 02188

This UAV was destroyed when it crashed in an open area near the rural commune of Anwaytaram, Timia, during a sortie from its base at Agadez, Niger. A spokeswoman for US Africa Command said that initial assessments indicated that the cause was mechanical failure and not hostile action. A single, unexploded Hellfire missile was later recovered from the crash site.

D: Mar 2
N: Turkish Armed Forces
T: Bayraktar TB2
S: (c/n 00-0108)

This UAV was shot down over Idlib, Syria.

D: Mar 2
N: Syrian Arab Air Force
T: Ababil AB.3

This Iranian-built UAV was shot down by Syrian National Army forces over Jabal al-Zawiya, Idlib,

Syria, using an FIM-92 Stinger man-portable air defence system.

D: Mar 3
N/U: Brazilian Air Force/Ala 10/2°/5° GAv
T: A-29B Super Tucano

During a routine training flight near Santa Rita beach, on the Rio Grande do Norte coast, the crew member in the back seat was accidentally ejected. He safely parachuted into the sea and was rescued by local lifeguards before being taken by a Brazilian Air Force search and rescue H-36 Caracal to the army hospital in Natal. The pilot flew the aircraft back to Base Aérea de Natal, where it landed without further incident.

D: Mar 3
N/U: Syrian Arab Air Force/5th Training Squadron
T: L-39Z0 Albatros

Turkish defence ministry officials announced that this aircraft had been shot down over Jabal al-Zawiya, west of Maarat al-Numan, Idlib, Syria, during Operation Spring Shield. It was reportedly struck by an AIM-120C missile fired by a Turkish Air Force F-16C over the border with Turkey. Both crew members ejected safely, but one, Colonel Ammar al-Boodi, was stoned to death after landing, reportedly by Hay'at Tahrir al-Sham jihadists, while the other was rescued by the Syrian Arab Army. The aircraft was operating from Kweres air base, Aleppo.

D: Mar 3
N/U: Turkish Air Force/302 Filo
T: Anka-S

A man-portable air defence system was used by the Syrian Arab Army to shoot down this UAV over Saraqib, Idlib, Syria.

D: Mar 3
N: Turkish Army Aviation Command
T: Bayraktar TB2

One of six of these UAVs supporting fighting in Idlib, Syria, was destroyed after being shot down by the Syrian Arab Army. The drones had been deployed from Batman, Turkey, to Hatay, close to the border with Syria, since February.

D: Mar 4
N: Russian Navy/Northern Fleet
T: Unidentified UAV



German Luftwaffe/HSG 64 CH-53GA 84+59 after its emergency landing in a field in the Elbe-Elster district. Luftwaffe

Côte d'Ivoire Air Force Mi-24D TU-VHO on its side and covered in foam after its crash in Abidjan on March 18. This is the second Ivorian 'Hind' with this serial, the previous being a Mi-24V now stored at Abidjan.



Five soldiers of the 61st Naval Infantry Brigade were injured when they approached a crashed UAV carrying a bomb which exploded as they neared it. All five were hospitalised with light injuries. The crash occurred during routine training activities at the Shary firing range near Luostari in the Pechenga Valley, about 12 miles (20km) from the border with Norway.

D: Mar 4
N/U: Turkish Air Force/302 Filo
T: Anka-S

This UAV was shot down by the Syrian Arab Army over the countryside near Idlib, Syria, during the evening. It was reported to be the tenth Turkish UAV downed over Syria within a space of 72 hours.

D: Mar 5
N/U: Finnish Air Force/
Hävittäjälentolaivue 41
T: BAe Hawk

While landing at Tikkakoski air base at approximately 1310hrs local time, the aircraft had brake failure and one of the mainwheel tyres burst, causing it to veer off the side of the runway at low speed. The two crew on board were uninjured and damage to the aircraft was reported to be minor.

D: Mar 5
N/U: Syrian Arab Air Force/17th
Fighter-Bomber
Brigade/697 Squadron
T: MiG-29SM

Shortly after take-off from Shayrat air base, this aircraft had a technical failure and crashed a few kilometres from the outskirts of Shayrat village, northeast of the Syrian airfield, killing the pilot, Colonel Yunes Al-Makdid. The *Fulcrum* had been deployed to Shayrat from its normal base at Saiqal/as-Seen.

D: Mar 6
N: Myanmar Air Force
T: Mi-17

Ten seconds after take-off from Kaungkha village, Kutkai township, in the northern Shan state, the helicopter encountered a technical problem causing the main rotors to stop at a height of only 100ft (30m) and was badly damaged in the ensuing emergency landing, during which the tail boom was torn away. The main rotors were also damaged, but the Mi-17 came to rest upright and still on its undercarriage. Of the 15 on board, only two of the crew were injured.

D: Mar 9
N/U: Turkish Air Force/14th
Unmanned Aircraft
Systems Base
Command/2nd UAV
Squadron
T: Bayraktar TB2

This UAV was destroyed when it crashed and caught fire in an open area in Syria after taking off from Batman air base in the southeastern Anatolia region of Turkey, which borders northern Syria. It is unknown whether it was shot down or had a technical failure, but Turkish sources reported that the latter was the suspected cause.

D: Mar 11
N/U: German Air Force/HSG 64



Above: The wreckage of Bolivian Air Force Z 242L Guru FAB-518 after its crash on March 21.

T: CH-53GA
S: 84+59

This helicopter made a safe precautionary landing at 1052hrs local time in an open field near the village of Grassau, Elbe-Elster district, due to a warning display illuminating in the cockpit from the magnetic chip detector in the main gearbox while flying approximately two miles (3km) east of Holzdorf air base. The helicopter appeared to be undamaged and no injuries were reported. It had returned safely to its base at Holzdorf by the following day.

D: Mar 11
N/U: Pakistan Air Force/
9 Squadron 'Griffins'
T: F-16A MLU
S: 92730

This aircraft crashed at around 1100hrs local time in woods close to the Pakistan Museum of Natural History Park, near Shakarparian, Islamabad, during rehearsals for the Pakistan Day parade and flypast over Islamabad scheduled for March 23. The pilot, Wing Commander Noman Akram, officer commanding 9 Squadron, was killed.

D: Mar 12
N/U: German Air Force/HSG 64
T: CH-53

Only 24 hours after a Luftwaffe CH-53 had made an emergency

landing, another example, from the same unit, also had to make a precautionary landing due to problems with its hydraulic system. The helicopter was en route from Laupheim to Holzdorf, but at 0940hrs local time it encountered a problem when flying to the east of Leipzig and was forced to put down on the B87 between Eilenburg and Doberschütz. A safe landing was made, and no injuries were reported.

D: Mar 18
N/U: Côte d'Ivoire Air Force/
Escadrille de Chasse
T: Mi-24D
S: TU-VHO

While taking off at approximately 0945hrs local time from Base Aérienne de Abidjan/Port-Bouët at Abidjan/Félix-Houphouët-Boigny International Airport, the helicopter crashed and rolled over, coming to rest on its starboard side with the main rotors and rear of the tail boom severed. The two crew members sustained only minor injuries and were able to exit the helicopter unaided.

D: Mar 21
N/U: Bolivian Air Force/Grupo
Aéreo de Entrenamiento 21/
Escuadrón Aéreo 210
T: Z 242L Guru
S: FAB-518

This aircraft was destroyed when it crashed at approximately 1455hrs local time near Chimoré during a local training flight from Chimoré Airport, Cochabamba. Both crew members were killed.

D: Mar 21
N: Mexican Navy
T: UH-60M Black Hawk

While attempting to land on a sports field in Tepecuitlapa, in the Tehuipango municipality of Sierra de Zongolica, Veracruz state, during a security operation, the helicopter's rotors created brownout conditions, reducing pilot visibility and causing it to crash. One state police officer was killed and the other 20 navy personnel on board were injured, while the helicopter was substantially damaged. The injured were taken to local hospitals and all were said to be in a stable condition.

Additional material from:
Igor Bozinovski, Scramble/Dutch Aviation Society and Asagiri Yohko.

Leonardo's Aircraft Division at Venegono in northeast Italy delivered a final M-346 Master to the International Flight Training School (IFTS) at Lecce-Galatina on October 30. Four aircraft have been added to the existing Aeronautica Militare (AM, Italian Air Force) fleet of 18 T-346As (the service's in-house designation for the M-346) to increase its advanced lead-in fighter training (LIFT) capacity.

Launch of the IFTS as a new partnership between Leonardo and the AM was announced on July 17, 2018 at the Farnborough International Airshow. The initial agreement was signed by the then Italian Air Force chief of staff, Lt Gen Enzo Vecciarelli and Leonardo's CEO Alessandro Profumo during an official ceremony at Farnborough attended by Italy's then defence minister Elisabetta Trenta. The outlined objectives of the collaboration were to further exploit the educational capabilities provided by the 61° Stormo (61st Wing) at Galatina and to establish a new flight school to support

tuition of both national and international pilots. During the ceremony, Profumo made the company's ambitions clear: "Leonardo has to move from being a platform supplier to being a service provider as well. We aim to become the international flight training school for all the fifth-generation air forces worldwide." Lt Gen Vecciarelli added: "With the IFTS, we expect to extend courses to other nations coming from the Middle East, Europe and potentially in the longer-term, Africa."

The IFTS has been created as a partnership, based on arrangements between both parties (government and private sector) to

finance, establish and operate the project. Under the agreement, the IFTS has access to the AM's training facilities while Leonardo provides four M-346s, plus ground educational systems and associated support.

IFTS establishment

The IFTS was initiated with the objective of consolidating the growth and the internationalisation process of the AM's flight school by increasing capacity and the range of courses available to foreign countries. In this way a growing demand for advanced flight training from allied and partner air forces can be



Masterclass

The International Flight Training School is now well on the way to becoming operational with the M-346 Master at Lecce-Galatina air base. **Marco Muntz** reports on the latest developments at the training centre in southeast Italy.



1 T-346A MM55230 '61-25' leaving its parking shed at the start of a training flight from Lecce-Galatina. Last year, the four T-346As allocated to the IFTS were predominantly used for qualification courses for the first six former military pilots to become IFTS instructors. Leonardo
2 Slightly more than half of the total amount of sorties during the IFTS courses will be flown in the simulator. A key element of the T-346 Integrated Training System (ITS) is the option to interconnect multiple simulators to one or more T-346s in flight. Leonardo
3 IFTS T-346A MM55230 '61-25' touches down on runway 14 at Lecce-Galatina at the conclusion of a training flight. The IFTS has been established under a partnership between Leonardo and the Italian Air Force and will initially provide Phase IV/advanced jet training using the AM training syllabus. Leonardo

3

satisfied. The IFTS will primarily provide advanced Phase IV courses from the AM syllabus – the LIFT phase – which prepare the student pilot to handle the latest fourth- and fifth-generation fighters such as the Eurofighter or F-35 in an operational environment. When the IFTS reaches full operational capability, it will be able to offer more than 70 courses every year – 20 training positions for AM student pilots and more than 50 for aviators from foreign allied countries. This will double the 35-40 pilots currently trained annually.

The IFTS curriculum will be based on the AM's current modular and versatile syllabus, exploiting Leonardo's innovative Integrated Training System (ITS). The advanced courses offered will consist of a standard set of modules that all student pilots have to complete. The standard package can then be expanded by adding modules such as advanced air-to-air training, advanced air-to-ground work with sorties to the Polygon range, use of

night-vision goggles (NVGs), aerial refuelling and specific groundwork focused on the use of sensors, data link and electronic warfare. A total of six different courses will be available and slightly more than half of the total sorties for each will be flown in the simulator.

Tailored package

The IFTS will offer tailored training modules to meet the specific needs of other countries' air arms. This will be achieved by a detailed analysis of the educational programme run in the relevant air force, including the basic phase. With this approach, the course can be optimised to improve the capabilities of the foreign student pilot while reducing the amount of practice required in an operational conversion unit (OCU). This will provide cost savings in terms of flight hours, time and resources.

In order to maximise the use of the T-346 fleet, the IFTS will ultimately employ 40 instructor pilots, with a split of 40% military and 60% civil. The latter will all be ex-military and will be trained, standardised and periodically examined by the 212° Gruppo (212th Squadron) of the 61° Stormo, to ensure they comply with all qualification requirements set by the AM. In this way, the quality of education provided by the IFTS will be guaranteed according to the AM's standard operational

procedures.

The first two IFTS instructor pilots had completed their training by June last year, swiftly followed by another four. These instructors are either contracted directly by Leonardo or work for Aeronautical Consulting & Solutions (ACS), an Italian company selected by Leonardo to provide both simulator and flight training. Since the selection process is open to pilots from all nations, the instructors trained to join the IFTS last year are not exclusively from Italy.

The additional four M-346s supplied to the IFTS by Leonardo were all assigned in 2019 at no additional cost to the Italian government. Last year, the aircraft were mainly used for qualification courses for the first six former military pilots to become IFTS instructors. ▶



ass in Italy



IFTS at Lecce-Galatina

1: This year, construction work begins to build new infrastructure at Decimomannu to accommodate the IFTS from 2021. A dedicated maintenance hangar and flight line for T-346 ground handling will be constructed. Other new structures include a Ground Based Training System (GBTS) building and a campus for students and instructors. **Leonardo 2:** When the IFTS achieves full operational capability – expected not long after the relocation to Decimomannu in 2021 – around 40 instructor pilots will provide training on the 22-aircraft T-346A fleet. Approximately 40% of IFTS instructors will be supplied by the Italian Air Force, equivalent to 15 AM pilots. **3:** Seen backtracking on Venegono's runway 36 prior to a test flight last October 14, T-346A MT55232 was transferred to Lecce-Galatina on the 30th to join the IFTS as the last of four Masters to be assigned. In 2019, this jet was used by Leonardo to promote the Fighter Attack version of the M-346 and participated at the Paris Air Show and the Royal International Air Tattoo at RAF Fairford, Gloucestershire. **4:** T-345A CSX55233 will be one of the first new trainers assigned to the 61° Stormo at Lecce-Galatina later this year. The first training courses on the T-345A are planned to start in 2021, alongside the gradual retirement of the MB-339 fleet.



When a first IFTS course opens to international student pilots at Galatina – this is scheduled for the first half of 2020 – training will be provided by a mix of AM and Leonardo instructors. For actual flying, as well as the four Masters assigned to the school, the IFTS can also draw upon the fleet of T-346s operated by the 212° Gruppo, whenever required. All elements of the Ground Based Training System (GBTS, the ground segment of the T-346 ITS), used by the 212° Gruppo will also be available to IFTS student pilots. GBTS comprises mission planning and debriefing stations, computer-based training to learn all technical aspects and systems of the M-346, a Part Task Trainer (PTT) featuring a 180° cockpit view to teach procedures and emergencies, plus two advanced Full Mission Simulators (FMS) built by CAE. The FMS gives the pilot a 360° view, exactly like in a real aircraft, and can be used in conjunction with a helmet-mounted display.

A key element of the ITS is the option to interconnect multiple simulators to one or more T-346s in flight in real time, using live, virtual and constructive (LVC) technology. Embedded Tactical Training Simulation (ETTS) technology on the actual aircraft enables the

replication and utilisation of various sensors, electronic countermeasures and armament. These modern (tactical) simulation techniques generate highly realistic virtual operational environments that are fundamental to the advanced and pre-operational training processes.

Second base

After the IFTS opens its doors later this year, the aim is to progressively increase the number of courses on offer. With the associated expansion in flying activity by the 61° Stormo, Galatina is getting closer to its maximum capability in terms of the training flights it can handle. Included in the plans to establish the IFTS was the relocation of the school to exploit the full potential of the T-346 ITS, enabling a further

expansion of advanced flight training capacity to an estimated 8,000 flight hours annually. The relocation of Phase IV to a different base will create space at Galatina to enhance the basic training offered by the 61° Stormo as it introduces the new T-345A (M-345) ITS. The number of T-345 flights could then be increased up to the wing's maximum operational capability at the base. Alongside this, relocating all advanced training will avoid the risk of possible conflict between the T-345 and T-346 due to the types' considerable differences in performance.

At the Paris Air Show last June, Decimomannu air base, located in the southern part of the island of Sardinia, was identified as the second training site alongside Galatina. Next year the IFTS will move to its new, dedicated facility. The transfer will entail the relocation of all 22 T-346s to Decimomannu.

As early as August 2018 – only a month after the signing ceremony at Farnborough to establish the IFTS – the defence ministry, the region of Sardinia and Leonardo started an evaluation of Decimomannu's ability to accommodate the IFTS in the near future. The defence ministry proposed the Sardinian base since it is already operational

T-346As of the International Flight Training School (IFTS)

Serial	c/n	Code	Delivery date
MM55229	NC7102	61-24	February 7, 2019
MM55230	NC7103	61-25	February 7, 2019
MM55231	NC7104	61-26	May 22, 2019
MM55232	NC7105	61-27	October 30, 2019





and well equipped, including modern (de)briefing facilities, while existing infrastructure includes large aprons, hangars and two runways to sustain a high volume of flights. Close to the station are multiple suitable areas of airspace for advanced training to cover any simulated scenario. Modern ranges for air-to-air and air-to-ground live firing are located nearby, among them an Air Combat Manoeuvring Instrumentation (ACMI) range and the Poligono Interforze del Salto di Quirra (PISQ), a high-technology instrumented range.

Decimomannu could also host international exercises in the future with IFTS participation. In addition, the base benefits from favourable meteorological conditions all year round. For the region of Sardinia, the presence of the IFTS should generate more than 200 civil jobs in an area where unemployment is high. In co-operation with the IFTS, universities could develop various study specialisation paths thanks to the high level of technological innovation involved in the virtual simulation techniques used. An expansion of training offered by the IFTS can be accommodated here in future, including Red Air and aggressor services and courses on other platforms

such as unmanned aerial vehicles (UAVs).

An investment in excess of €40m is required to make all necessary adjustments to Decimomannu's existing infrastructure to house the IFTS. A logistics and maintenance centre will be constructed, including a new maintenance hangar and flight line intended for T-346 ground handling. A structure for the new GBTS will comprise associated classrooms, offices and space to house two PTTs and two FMS. A brand new campus for both students and instructors is being developed to include 100 apartments, a restaurant, an officers' club, sports facilities and swimming pool. Construction work will start this year and the first advanced course for IFTS student pilots using the new facilities at Decimomannu is planned for the end of 2021.

Synergy and innovation

The expertise offered by the AM and Leonardo in their respective areas of military flight education is crucial for the development, quality and, ultimately, the success of the IFTS as a flight training provider. Leonardo is supplying the AM with the latest software and simulation technology to enhance its level of military flight training. In

collaboration with the Comando Scuole AM (Italian Air Force Training Command), the company has developed advanced software to make the best use of all training resources available. The Training, Management and Information System (TMIS) is currently being trialled and implemented by the 212° Gruppo to manage Phase IV work on the T-346. TMIS manages the planning and scheduling of daily training activities with minimal human intervention, optimising all available (educational) resources including teaching facilities, static and dynamic simulators, aircraft and logistics as well as students, instructors and technicians. The TMIS Course Management module supports syllabi and courses by providing tools to adjust and enhance the student's learning trajectory while evaluation functions will give the instructor an accurate picture of the candidate's progress. TMIS is set to be a fundamental tool for the IFTS to efficiently manage the school's potential.

The high standard of the modular syllabus of the AM flight school at Galatina – and the LIFT track on the T-346 in particular – has attracted the interest of many foreign air forces in recent years. Both student pilots and instructors from abroad have been trained, or instruct at Galatina within the 61° Stormo, underlining the AM flight school's international aspirations. Previous experience in tutoring foreign student pilots and collaboration between the AM and various allied air forces in the military flight training domain will surely be beneficial to the IFTS to ensure a high level of education.

The introduction of the new T-345 into the syllabus will contribute to the transformation of the AM flight school into a modern facility. Like the T-346, the concept is designed around an integrated training system. At Galatina, the T-345 will be used for both Phase II (basic pilot training and selection) and Phase III fighter track (specialised pilot training), covering the entire basic training segment, and gradually replacing both versions of the MB-339 (T-339A and FT-339C) currently operated by the 61° Stormo. Compatibility between the T-345 and T-346 will make the future transition from Phase III to Phase IV smoother in comparison with the current jump from the FT-339C.

The relocation of all T-346s to Decimomannu next year will enable the 61° Stormo to consolidate the provision and expansion of Phase II and Phase III activity on the new aircraft at Galatina. With the start of the first courses on the T-345, planned for 2021, a new era in Italian military pilot training will begin, using a range of innovative integrated systems to best prepare the military student aviator for transition to the latest generation of combat aircraft in an increasingly demanding environment. In the future, the range of education offered by the IFTS could well be expanded to incorporate all basic flight training on the T-345, thereby covering the entire syllabus.

With the establishment of the IFTS and forthcoming introduction of the T-345, the AM's leading-edge educational solutions look set to continue to generate broad interest from foreign air forces as they search for customised advanced and pre-operational military flight training. The future for IFTS is looking bright. **AFM**

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IADE in Tunis

The first airshow of its kind provided a rare opportunity to view the Tunisian Republic Air Force at close quarters. **Arnold ten Pas** reports from Djerba Airport.



Above: A three-ship of F-5F Y92504 'IB' (c/n HX1002, FMS 82-0641) from 15 Squadron and smoke-trailing L-59Ts Y95-065 'JH' (c/n 585805) and Y95-059 'JE' (c/n 585806) from 13 Squadron. The trio performed at the opening ceremony and on the second public day. All photos Arnold ten Pas unless stated

Tunisian Republic Air Force Al-Quwwat al-Jawwiya al-Jamahiriyyah At'Tunisia

Base	Squadron	Type(s)
Bizerte	15 Squadron	F-5E, F-5F
	21 Squadron	C-130B, C-130H
	32 Squadron	AB205A, Bell 205A-1, UH-60M
	36 Squadron	UH-60M
Borj el Amri	EABA	PA-28, TB9, TB10, TB20
Gabès	33 Squadron	SA341/SA342
	37 Squadron	OH-58D(R)
Gafsa	34 Squadron	OH-58D(R)
Sfax	13 Squadron	L-59T
	14 Squadron	SF-260CT, SF-260W
	31 Squadron	AS350B, SA341/SA342
Tunis-Carthage/ El Aouina	11 Squadron	C-130J-30
	12 Squadron	L-410UVP-E20
	35 Squadron	Bell 412
	?? Squadron	Maule MX-7-180B*
	Government Flight	Boeing 737-7H3

* MX-7s are distributed across several locations and are used as border patrol aircraft.

Right: During IADE, all three still-active L-410s were seen ferrying VIPs to and from the show. One of the 21 Squadron Turbolets noted at the event was L-410UVP-E20 Z94049/TS-OTI (c/n 962709).

The International Aerospace & Defence Exhibition (IADE) was held at Djerba Airport on the island of the same name, from March 4 to 8. The event broke new ground as the first big airshow of its kind in Tunisia, where local military aviation is not normally very accessible. The exhibition was organised by the same team responsible for the Marrakech Air Show, which was first held in 2008. Tunisia is now promoting itself as a strategic defence and aeronautical partner for the entire African continent and the organisation has

committed to staging IADE biennially for the next ten years. The biennial Marrakech Air Show would normally be taking place this year but has been postponed to 2021 to avoid it clashing with IADE in the years to come.

The first three days of the Tunisian event were focused on trade, while the public was invited to attend the last two. On the first day, IADE was officially opened in the presence of the country's president and commander-in-chief, Kais Saied. The ceremony included a fly-by of a Tunisian Republic

Air Force (TRAF) F-5F from 15 Squadron, flanked by a pair of L-59Ts from 13 Squadron. This was the only air force participation until the second public day, when the fly-by was repeated, followed by a UH-60M demonstration. The airshow also included performances by a Turkish Air Force F-16 of the Solo Türk demo team and the Saudi Hawks. Originally, more TRAF assets had been scheduled, but were cancelled.

The United States provided the majority of the aircraft in the static park, displaying a P-8, C-130J, KC-135 and



ia



Above: Veteran AB205A L81-705 (c/n 4472) with L-410UVP-E20 Z94047/TS-OTG (c/n 962708) taxiing in the background. The TRAF's light rotary fleet includes around 20 AB205A and Bell 205A-1 aircraft, assigned to 32 Squadron, but they can be found operating throughout the country. **Left:** This AB412, serial L82-604, is one of at least four in use with 35 Squadron at Tunis-Carthage. The aircraft's immaculate appearance belies its VIP transport role. The type entered service from 1992.

a pair of F-16s. Besides these, local air arms showed a C-130J, OH-58D(R) and a National Guard Bell 429. Further participants for the static show were announced in advance but did not materialise. Bearing in mind the ambitions of the organisers, this will hopefully be addressed in future in order to attract more visitors.

Following various acquisitions in recent years, IADE provided a good opportunity to confirm the new units established within the TRAF. The current order of battle is thought to be as follows:

Tunisian transports

The TRAF has been a long-time user of the Hercules, with examples of the C-130B, C-130H and the latest C-130J in the inventory. All but one of the eight C-130Bs have been withdrawn from use and only a single C-130H survives with 21 Squadron. With the delivery of two C-130Js in 2013 and 2015, 11 Squadron – a former MB-326 operator – was transformed into a transport unit. With two C-130Js in service and just a single C-130H and C-130B left, there's a need for two additional

C-130Js, but no formal contract has been signed.

Three L-410UVPs remain in service with 12 Squadron, out of five delivered. They are used for light transport, VIP transport and medical evacuation.

Jet fleet

The backbone of the TRAF is provided by the F-5E/F, acquired from the US. Four two-seat F-5Fs were delivered, one of which was lost in an accident in 1996. Two surviving F-5Fs were seen during IADE, sporting a Tunisian flag scheme on the underside of the aircraft.

Of the 12 F-5Es delivered, ten remain in service with 15 Squadron at Bizerte.

In search for additional firepower, the TRAF is aiming to buy four AT-6C Wolverine light attack aircraft. A US\$325.8m deal was approved by the US State Department in late February (see *Headlines*, April, p7), just before the start of IADE. It covers a wide variety of supporting equipment, including GBU-12 guided bombs and the Advanced Precision Kill Weapon System (APKWS). Besides that, pilots and technicians will be trained on

the new aircraft. The delivery dates of the Wolverines have not been announced.

Six L-59Ts remain in service with 13 Squadron at Sfax. Originally, 12 were delivered in the mid-1990s, but three have been lost over the years and another three are stored. The L-59T, an export version of the L-39MS, is used for both advanced training and light-attack duties and is equipped with four underwing hardpoints and a centreline GSh-23L cannon.

The L-59T's training role will likely be taken

Below: The final H-model Hercules in service with the TRAF is C-130H Z21012/TS-MTB (c/n 5021, ex N41030) flown by 21 Squadron. A single C-130B also remains active.



over by T-6Cs in the near future. Last October, the US State Department approved the US\$234m sale of 12 T-6C Texan IIs to Tunisia, a sale the US Defense Security Cooperation Agency said at the time would help support Tunisia's "counter-terrorism and border security missions". No details were given about a possible delivery date or base.

Rotary assets

For light transport, "over 20" AB205A and Bell 205A-1 helicopters are in service. Assigned to 32 Squadron, the aircraft can be seen at several bases. All UH-1s have now been withdrawn. At least four AB412s are also in TRAF service, being used for VIP transport with 35 Squadron at Tunis-Carthage. In 2014, Tunisia requested the purchase of 12 SH-60Fs through the Foreign Military Sales (FMS) programme. At the time, the requirement was for (refurbished) SH-60Fs to replace the existing HH-3Fs but changing circumstances in Tunisia saw the request changed to eight new UH-60Ms, plus Battle Hawk kits. Delivery of the first four helicopters took place in 2017, while the remaining four were handed over in June 2018. Included in the US\$338m deal was pilot training at Fort Rucker, Alabama, and other support. It also covered an undisclosed number of Level

2 Battle Hawk kits allowing the UH-60Ms to be used as attack helicopters. The TRAF's kits include machine guns, Hydra-70 rocket pods, Hellfire launch systems and a laser-guided rocket capability. In May 2016, the sale of 24 former US Army OH-58Ds to Tunisia was approved. Struggling with terrorist attacks, the country was in need of new equipment. The first six helicopters were delivered to the newly

established 37 Squadron at Gabès in February 2017. The 18 remaining OH-58D(R)s were delivered later that year, both to 37 Squadron and to the Sfax-based 34 Squadron. Pilot training on the OH-58D(R) was conducted at Roswell International Air Centre, New Mexico, by Integration Innovation Inc (i3) from September 2016 onwards; in all, 24 pilots and 50 technicians were trained. The sale of the helicopters, worth US\$100m,

also extended to the delivery of equipment and weapons, including Common Missile Warning Systems (CMWS), AGM-114R Hellfire missiles, M134 Miniguns, rocket launchers and APKWS rounds.

Training

Basic training for all pilots wishing to join the air force is conducted at the Ecole de l'Aviation de Borj el Amri (EABA, Borj el Amri Aviation School). The EABA is a military higher education institution under defence ministry supervision, and under the patronage of the chief of the air staff. It was created in 1994 from the merger of the School of Civil Aviation and Meteorology (created in 1968) and the Air Academy (established in 1984) and is located in the grounds of Borj

el Amri Airport, 14 miles (23km) southwest of Tunis. Operating under the motto 'At the highest', the school is a civil aviation-approved national centre offering training in aeronautics, air traffic and meteorology.

After a theoretical phase lasting 1,350 hours spread out over 18 months, the student undergoes a national examination organised by the Ministry of Transport.

Next is the practical phase: another 18 months, followed by award of either a fighter pilot or helicopter pilot certificate for students destined to join air force air units. The unit uses both single-engine and twin-engine aircraft for training, all civil registered. After graduating, pilots destined for the TRAF receive further instruction within its own units. **AFM**



Left: Both surviving TRAF F-5Fs were seen during IADE, sporting a Tunisian flag scheme on the underside of the aircraft. **Below right:** Supplied under Foreign Military Sales channels, Kiowa Warrior serial L81520/TS-VTR is one of 24 former US Army OH-58Ds that went to Tunisia together with AGM-114R Hellfire missiles, M134 Miniguns, rocket launchers and APKWS rounds. **Below left:** As well as TRAF types, the Tunisian National Guard was present at the show, with Bell 429 G81-103/TS-QGC (c/n 57295, ex N746BH). Three GlobalRangers were acquired to establish the guard's air unit in early 2017. Shaun Psalia



Above: A recent acquisition, UH-60M L82-304/TS-SRT is operated by 36 Squadron and appeared in the IADE flying display. These Black Hawks can be outfitted with the Battle Hawk kit that includes machine guns, Hydra-70 rocket pods, Hellfire launch systems and a laser-guided rocket capability. **Below:** The TRAF has a requirement for additional Super Hercules beyond the two currently in service. Among them is C-130J-30 221121/TS-MTK (c/n 382V-5718, FMS 11-5718), serving with 11 Squadron at Tunis-Carthage/El Aouina. **Right:** James Lawrence



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Photos: Paulo Mata *UK scheduled on-sale date. Please note that overseas deliveries are likely to be after this date.

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